2012 PROCEEDINGS

57th Atlantic Coast Ag Convention & Trade Show

January 17-18, 2012

Sponsored by
Vegetable Growers' Association of New Jersey, Inc.

In Conjunction with
Rutgers Cooperative Extension

And the
New Jersey Department of Agriculture

Trump Taj Mahal
1000 Boardwalk at Virginia Avenue
Atlantic City, New Jersey

Education Program Chairman
Mel Henninger
Specialist in Vegetable Crops

Session Organizers

Tuesday, January 17

Vine Crops – Michelle Casella, Agricultural Agent, Rutgers Cooperative Extension of Gloucester County.

Green/Herbs – Rick VanVranken, Agricultural Agent, Rutgers Cooperative Extension of Atlantic County

Soil Fertility – Meredith Melendez, Program Associate, Rutgers Cooperative Extension of Mercer County

Food Safety – Wesley Kline, Agricultural Agent, Rutgers Cooperative Extension of Cumberland County

Transplants – Bill Hlubik, Agricultural Agent, Rutgers Cooperative Extension of Middlesex County

Peppers – Andy Wyenandt, Extension Specialist in Vegetable Pathology, Rutgers Cooperative Extension

Plant Growth and the Environment Workshop – Michelle Casella, Agricultural Agent, Rutgers Cooperative Extension of Gloucester County

Farm Safety – Raymond Samulis, Agricultural Agent, Rutgers Cooperative Extension of Burlington County

Wednesday, January 13

Brown Marmorated Stink Bug – George Hamilton, Specialist in Entomology, Rutgers Cooperative Extension

Sweet Corn – Raymond Samulis, Agricultural Agent, Rutgers Cooperative Extension of Burlington County

Direct Marketing – Rick VanVranken, Agricultural Agent, Rutgers Cooperative Extension of Atlantic County

Tomatoes – Peter Nitzsche, Agricultural Agent, Rutgers Cooperative Extension of Morris County

New Jersey Agribusiness Association Session – Jenny Carleo, Agricultural Agent, Rutgers Cooperative Extension of Cape May County

Blueberries – Gary Pavlis, Agricultural Agent, Rutgers Cooperative Extension of Atlantic County

Wildlife Control – Mel Henninger, Extension Specialist Emeritus, Rutgers Cooperative Extension

Proceedings

of the

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After the meeting, additional copies of the Proceedings may be obtained by contacting:

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RUTGERS COOPERATIVE EXTENSION

NEW JERSEY AGRICULTURAL EXPERIMENT STATION

Rutgers NJAES Vegetable Working Group's new Vegetable Crops Agriculture Update blog http://jerseyvegcropsagupdates.blogspot.com/ Online and ready for the coming season.

Management decisions are often made by answering a series of 'what if' questions. Here are a couple to think about:

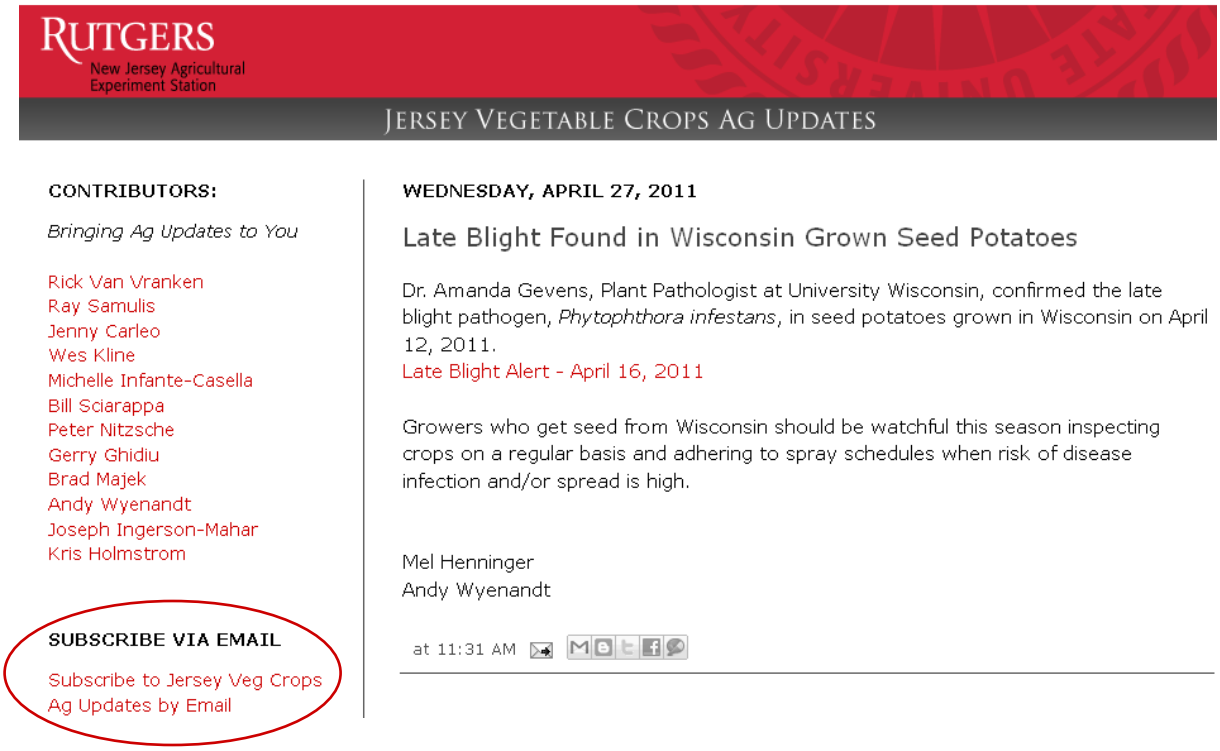
What if you knew each morning what pests were being found the day before in your area? Would you be able to make better decisions about what to put in the spray tank that morning?

What if you could quickly check a web site to see the current weather, a calendar of upcoming grower meetings, links to all Rutgers vegetable production resources in one spot? Would that help your daily routines?

The new Rutgers Vegetable Crops Agriculture Update blog allows you to do just that. Check the site to get our daily observations from the field and around the industry. Subscribe to the daily feed and each morning that there is a new post, headlines will be emailed to you early enough to change plans if necessary. Need more details and the links will take you to the full story.

The benefit of the information age for your business is having the best available resources at your fingertips to help you plan your day and make decisions. The Rutgers Vegetable Crops Agriculture Update blog will bring you the most up-to-date local observations from your county agricultural agents, state vegetable specialists and our IPM program coordinators.

Go to http://jerseyvegcropsagupdates.blogspot.com/ now to check out this new resource, and click on the subscribe button in the left column to get the daily feeds.



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VINE CROPS

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UPDATE ON CUCURBIT DISEASE CONTROL

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In recent years downy mildew has become a significant problem in cucurbit crops throughout the US. Symptoms of downy mildew include irregular, chlorotic (yellow) spots which develop on the upper leaf surface of cucurbit crops. These lesions expand and cause leaves to turn from yellow to brown often resulting in a scorched appearance in a few days if left untreated. Diagnostic characteristics of downy mildew are the purplish-brown spores which develop on the bottom side of infected leaves. Spores can easily be seen with a 10x hand lens. Control of downy mildew begins with the early recognition of symptom development and preventative fungicide applications. Fungicide resistance to downy mildew has been reported and there is some evidence that a new race(s) of the pathogen may be present in the US. Since fungicide resistance to other important cucurbit diseases, such as powdery mildew and gummy stem blight already exist in our area, proper preventative fungicide application programs must be followed.

Powdery mildew (*Podosphaera xanthii*) continues to be one of the most important foliar diseases of cucurbit crops in New Jersey. Symptoms of powdery mildew include white 'fluffy' colonies which develop on upper and lower leaf surfaces, vines and handles of fruit. Control of powdery mildew begins with planting powdery mildew resistant/tolerant cultivars and early detection of symptoms along preventative fungicide maintenance programs. Fungicide resistance to powdery mildew has been detected in NJ and growers need to follow fungicide labels and restrictions accordingly.

Fusarium fruit rot (*Fusarium* spp., *Fusarium solani* f. sp. *cucurbitae* race 1) is an important soil-borne disease in cucurbit crops. Fusarium fruit rot is often a problem in fields which have been in continual cucurbit production or with little rotation. Symptoms caused by Fusarium fruit rot include reddish-purple circular lesions with tannish-white centers which develop on the 'belly' side of the fruit which is in direct contact with the soil. Symptoms often go unnoticed until harvest. Control of Fusarium fruit rot begins with a proper crop rotation of at least 3 to 4 years. Unfortunately, fungicide applications will not give adequate control due to the difficulty of getting proper coverage. Cover crop mulches, such as winter rye (*Secale cereale*), killed and left on the soil surface have been shown to reduce Fusarium fruit rot development by keeping fruit from direct contact with the soil.

Phytophthora blight caused by *Phytophthora capsici* is an important soil-borne disease of cucurbit crops. Symptoms of Phytophthora blight include the collapse and wilting of developing plants and vines and white 'greasy' spore development of infected fruit. Phytophthora blight development is favored by wet conditions and saturated soils. Control of Phytophthora blight begins with proper crop rotation. Since the pathogen can survive in the soil for many years, fields should be rotated out of all susceptible crops, which include pepper, tomato, and all other cucurbits. Avoid planting in fields with low lying areas and/or with a history of standing water.

Plectosporium blight (also known as white speck) formerly known as Microdochium blight is a soil-borne disease which causes white to tan spindle shaped lesions on leaves, petioles, vines, stems and fruit. Infected stems become dry and brittle which can cause death of leaves and complete defoliation if left untreated. Fruit infections will cause cosmetic damage to fruit making them unmarketable. Control of Plectosporium blight begins with the early diagnosis of symptoms and preventative fungicide applications.

The diagnosis and control of these diseases and other important diseases of cucurbit crops will be discussed. An update on the newest fungicide chemistries available for controlling important diseases in cucurbit crops will also be presented.

LEAF MULCH FOR PUMPKIN PRODUCTION

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Over the last two decades numerous field trials have demonstrated that city shade trees can be used to build soil fertility and benefit crop production. Leaves contain plant nutrients that are released slowly to crops over a period of several years after application. The material is especially rich in calcium and tends to raise soil pH. Leaf mulch improves soil quality, builds soil organic matter content, increases soil water holding capacity, reduces drought stress, and prevents soil erosion.

Field trials with pumpkin found that when leaves are applied as surface mulch, the crop could be grown free of annual weeds without use of any herbicide. The leaf mulch was also found to result in improved pumpkin fruit quality, increase fruit size, and crop yield. Using leaf mulch in place of herbicides to control weeds can save pumpkin growers about $40 per acre.

For U-pick operations, having accessible fields during wet conditions is critical. Because leaf mulch helps produce a cleaner fruit, it can make field conditions more enjoyable for agricultural tours. Besides keeping mud off of the fruit, the mulch also prevents mud from adhering to customer shoes.

To provide an effective mulch layer, leaves should be applied late spring as a six inch layer over the field area just prior to planting pumpkin. Generally two passes with a manure spreader are needed to achieve a six inch mulch layer. Pumpkins can be hand seeded in wide rows by brushing aside the mulch at the place where the seeds are being planted. This amount of leaf mulch applies per acre about 400 pounds of very slow-release N along with other nutrients. Because leaves have a high C/N ratio (average 50/1), the mulch tends to cause crops to experience a temporary N deficiency. However, research shows that no more than the usual recommended amount of N is needed for growing pumpkin with leaf mulch if sidedress is applied early.

When using leaf mulch, there are two effective ways to prevent N deficiency from occurring. One approach is to grow a good legume cover crop before planting pumpkin, to build up the soil N supply. Another is to apply N fertilizer along beside the pumpkin row early in the growing season when the vines are about six inches long.

The benefits from leaf mulch application are not limited to pumpkin. In rotation crops, sweet corn, ear size and yield may be increased. In rye and soybean, the residual benefits of leaf mulch were visually apparent two to three years after the initial application.

GREENS/HERBS

SESSION

EVALUATING FUNGICIDES FOR THE CONTROL OF BASIL DOWNY MILDEW AND EVALUATING *OCIMUM* SPECIES, CULTIVARS AND BREEDING LINES FOR SUSCEPTIBILITY TO BASIL DOWNY MILDEW

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One of the most commercially significant fresh culinary herb crops in the United States and Europe is sweet basil (*Ocimum* spp.). Grown in warm and temperate climates, basil is used as a flavoring, spice, health product, fragrance, and medicine. During the fall of 2007, a new disease of basil in the United States, downy mildew (*Peronospora belbahrii*) was first reported in Florida. Since 2007, basil downy mildew has caused significant losses in the eastern United States. Once infected basil develops symptoms, plants are no longer marketable. Basil downy mildew symptoms include yellowing between leaf veins, cupping, purplish-brown sporangia that develop on the abaxial surface of the leaf, and eventual necrosis. The pathogen favors mild to warm temperatures, high humidity, wet conditions, poor air circulation, and long durations of leaf wetness. Little is known about the disease cycle. However, it is known that the pathogen is spread through wind currents and infested seed. Few registered chemicals make the pathogen very difficult to control.

During the summers of 2010 and 2011 at the Rutgers Agricultural Research and Extension Center (RAREC) in Bridgeton, NJ, 8 conventional and 6 organic fungicides were evaluated for efficacy in field trials using the susceptible variety, Johnny's Italian Large Leaf basil. Nine weekly fungicide foliar applications were made over the course of the growing season, from the first week of August until the first week of October in each year. Basil downy mildew severity was recorded weekly by visually examining twenty-five randomly selected leaf samples per replicate. In both years, the systemic fungicide, K-Phite (phosphorous acid, FRAC Code 33) provided the best level of control. This product is registered for field and greenhouse use on basil. Moderate control was obtained from Presidio (fluopicolide, FRAC Code 43, to be submitted for pesticide registration 11/12), Revus (mandipropamid, FRAC Code 40, to be submitted for pesticide registration 3/12), Ranman (cyazofamid, FRAC Code 21, submitted for pesticide registration 10/11), and Reason (fenamidone, FRAC Code 11, to be submitted for pesticide registration 10/13).

In addition to fungicide trials, from 2009 to 2011, variety trials were conducted in northern and southern New Jersey to comparatively identify different basil species and varieties as to their susceptibility to downy mildew. Over 35 commercially available basil species and varieties that varied greatly in morphology and growth habits were screened for susceptibility to basil downy mildew. These included lemon, spice, sweet and purple foliage basils. In each year, basil downy mildew susceptibility ratings were recorded four times over the course of two months (from August to October) by visually examining twenty-five randomly selected leaf samples per replicate. From this work, it was determined that the lemon (*Ocimum x citriodorum*) and spice (*Ocimum americanum*) basils were the least susceptible to basil downy mildew, while sweet basil (*Ocimum basilicum*) varieties were most susceptible. While the degree of susceptibility to basil downy mildew appears to depend on variety and species, to date, all commercial lines of the traditional sweet basil are susceptible, though can vary to some extent on the degree of infection. Currently, there is no known resistance or tolerance to basil downy mildew in Sweet basil. The explanation for resistance in other species of basil may partially relate to the morphological characteristics of the leaf including leaf flatness and texture, varying growth patterns and/or essential oil content. Further studies are being conducted to determine the characteristics that favor basil downy mildew resistance. This may aid in developing resistant cultivars.

LETTUCE TIPBURN - PREDICTION & PREVENTION

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(Adapted, with permission, from: SMITH, R., T. HARTZ and R. HAYES. 2011. Overview of Tipburn of Lettuce. California Cooperative Extension field meeting handout.)

In May 2011, several romaine lettuce fields around the greater Vineland area exhibited moderate to severe levels of the physiological disorder known as Lettuce Tipburn. Growers associated the appearance of the Tipburn symptoms with an unusual week-long period of near- and record-breaking temperatures in the high 90s to over 100 degrees Fahrenheit experienced in southern New Jersey shortly before the symptoms appeared. Much of the lettuce in those affected fields was deemed unmarketable and entire fields were abandoned (Fig. 1). It was too difficult and costly to locate the few remaining unaffected heads among those exhibiting the disorder.

The association of Tipburn with high temperatures implies that the disorder is a physical burning of the tissue. However, like Blossom End Rot of tomato, it has been shown to be a localized calcium deficiency in rapidly growing tissues which results in death of cells and the appearance of necrotic tissue on the edges of lettuce leaves (Fig. 2) – the name Tip*burn* is a bit misleading. Actually, the 'tip' portion might be confusing as well. The challenge for lettuce growers is that the most rapidly growing tissues are the leaf *edges* expanding within the head and can only be found by cutting it open for internal inspection.

Though less impressed upon their memories, growers in the area also recalled that the week of high temperatures was preceded by several days of cool, hazy weather. The significance of these more common conditions during the final couple of weeks before harvest was overshadowed by the record temperatures the following week, but a review of the literature reveals that these more common conditions appear to be the greater factors in the development of Lettuce Tipburn. Indeed, Wien and deVilliers (2005) consistently induced tipburn in multiple trials by growing lettuce in elevated levels of relative humidity.

Smith, Hartz and Hayes (2011), Vegetable Crops/Weed Science Farm Advisor, Extension Vegetable Specialist, and USDA Lettuce Breeder, respectively, summarized their work on Lettuce Tipburn for their California growers explaining that "…two key factors affect the development of localized calcium deficiency:

1. uptake of adequate calcium from the soil, and

2. calcium transport through the plant."

In studies conducted from 2005-2006, Hartz, et al (2007) showed that soil calcium levels in the lettuce growing areas of the Central Coast were optimal for plant growth. They analyzed several methods of measuring soil calcium levels and determined saturate paste extract was best at indicating the availability of soil calcium to the plant. The saturated paste extract can be easily converted to the concentration of calcium in the soil water, as well as pounds of calcium per acre in the soil water. In a two-year survey of a number of soils in the Salinas and Central

Valleys, except for one sandy soil found to have calcium levels below 200 ppm, calcium concentrations in the soil water were found to average about 680 ppm. This level exceeds the 100 – 200 ppm calcium levels that are used in hydroponic vegetable production systems.

The second part of the Hartz et al studies was to evaluate the effect of supplementing soil calcium with calcium thiosulfate, calcium nitrate and calcium chloride via drip irrigation at the rate of 10-15 pounds of calcium per acre. As the amount of available calcium in the soil water in these evaluations was approximately 200 pounds/A, the additional 10-15 pounds provided no impact on Tipburn symptoms because the fertigated calcium was only a small fraction of what already existed in the soil.

If soil calcium levels seem to have no impact on Tipburn occurance, is the effectiveness of calcium transport through the plant the more significant factor? Smith, Hartz and Hayes' (2011) summary indicates calcium moves in the xylem by transpirational flow and is delivered to all parts of the plant this way. *They cite the following factors that reduce transpiration which in turn reduces calcium availability to leaf tissue and may lead to Tipburn symptoms:*

- the youngest, rapidly growing leaves in lettuces are enclosed in the head or are the innermost protected parts of romaine and leaf lettuces - they are not transpiring as readily as outer wrapper leaves which can transpire freely.
- root growth of lettuce decreases approximately two weeks prior to maturity which can further impede the supply to calcium to the transpiration stream.
- foggy (cool, hazy) weather (Smith et al., 2011) and high relative humidity (Wien and deVilliers, 2005) lowers evapo-transpiration rates (Et) - occurrence in the last 6-10 days before harvest is conducive to the development of Tipburn.

Additionally, growth patterns and the physiology of various lettuce types and individual cultivars affect their susceptibility to Tipburn (Tables 1-3). In a study conducted in 2005 and 2006, Jenni and Hayes showed that, in general, head lettuce types are less sensitive to Tipburn than romaine types. They attributed this primarily to greater efforts dedicated to selecting for Tipburn resistance in head lettuce breeding programs, but also observed that "the degree of head closure was significantly associated with Tipburn incidence." (Jenni and Hayes, 2010).

A practice that may have an impact in reducing Tipburn is application of foliar sprays of calcium prior to and/or during the critical period of lettuce development. Anecdotal evidence from a couple of southern NJ farms indicated a positive impact. Smith was conducting several trials of this technique in late 2011 to evaluate the efficacy of various calcium sources at recommended rates to apply weekly doses of 0.15 to 0.20 lbs of calcium. He was hoping to answer if enough calcium could get into the plant at the right time and if the calcium applied to the outer surfaces would reach the tissue most likely to develop symptoms, given that calcium does not readily move in the phloem of the plant.

Conclusions: If in continual vegetable production, NJ coastal soils generally have adequate levels of soil calcium, but should be tested and supplemented as necessaryt to be sure there is well over 200 ppm of calcium in the soil water for optimal plant growth. Selection of resistant varieties is a greater factor for avoiding the development of Lettuce Tipburn. In addition, monitor for conditions that reduce transpiration rates (cool temperatures and persistent fog/haze) in the last 6-10 days prior to harvest. This can restrict the availability of calcium to all parts of the leaves and will likely trigger this disorder in sensitive varieties. Immediate harvest of smaller plants, possibly for alternative markets, before Tipburn symptoms appear may be an option until better prediction and management tools can be developed and refined.

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HARTZ, T. K., P. R. JOHNSTONE, R. F. SMITH and M. D. CAHN. 2007. Soil Calcium Status Unrelated to Tipburn of Romaine Lettuce. HortScience 42(7): 1681-1684.

JENNI, S. and R. J. HAYES. 2010. Genetic variation, genotype X environment interaction,
and selection for tipburn resistance in lettuce in multi-environments. Euphytica (2010) 171:427–439.

SMITH, R., T. HARTZ and R. HAYES. 2011. Overview of Tipburn of Lettuce. California Cooperative Extension field meeting handout.

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Table 1. **Head Lettuce**: percent of plants with Tipburn tested in Salinas, California and Yuma, Arizona (adapted from Jenni and Hayes, 2010 *in* Smith, Hartz and Hayes, 2011).

Variety	California		Arizona		
	Salinas		Yuma		
	2005	2006	2005	2006	Mean
Calicel	99.0	78.0	99.0	100.0	88.7
Calmar	16.7	40.0	89.3	60.0	51.5
Cochise 47	43.3	13.3	79.3	66.7	50.7
Desert Spring	40.0	76.7	89.7	80.0	71.6
Diamond	1.0	36.7	86.0	13.3	34.3
Gabilan	53.3	20.0	46.7	0.0	30.0
GLMesa659	37.0	40.0	99.0	33.3	52.3
Head Master	10.3	39.6	76.3	33.3	39.9
Navajo	16.7	66.7	73.0	20.0	44.1
Pacific	1.0	8.1	49.7	40.0	24.7
Salinas	14.0	46.7	76.3	13.3	37.6
Silverado	7.0	26.7	66.3	0.0	25.0
Sniper	26.7	26.7	76.3	26.7	39.1
Sundance	30.3	80.0	69.7	20.0	50.0
Tiber	1.0	53.3	69.7	13.3	34.3
Van 75	40.3	60.0	36.7	60.0	49.3
Vanmax	43.3	90.0	79.3	26.7	59.8
Mean	28.3	47.2	74.3	35.7	46.1

Fig. 1. A picture perfect field of romaine lettuce ready to harvest reveals >90% incidence of Tipburn upon closer inspection making the entire field unmarketable.

Fig. 2. Tipburn symptoms along the edges of inner leaves of romaine lettuce.

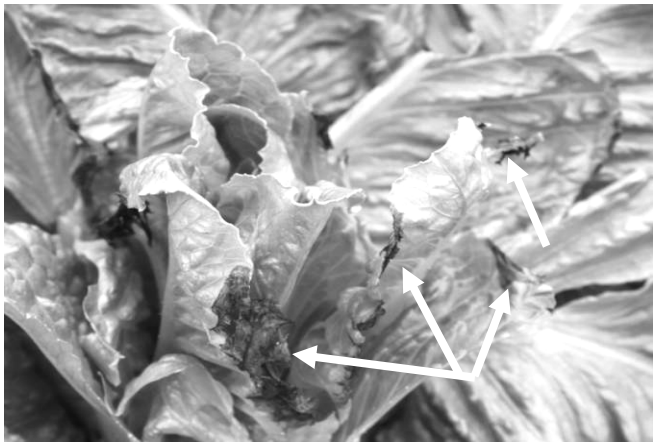

Table 2. **Romaine**: percent of plants with Tipburn tested in Salinas, California and Yuma, Arizona (adapted from Jenni and Hayes, 2010 in Smith, Hartz and Hayes, 2011).

Variety	California		Arizona		
	Salinas		Yuma		
	2005	2006	2005	2006	Mean
Avalanche	88.9	86.7	99.0	46.7	77.7
Beretta	53.3	80.0	79.7	93.3	76.6
Brave Heart	70.0	86.7	76.3	33.3	66.6
Caesar	49.7	80.5	73.0	9.1	57.2
Clemente	37.0	50.0	59.7	33.3	45.0
Conquistador	93.0	78.3	82.7	33.3	71.8
Darkland	53.3	80.0	86.3	66.7	71.6
Fresh Heart	99.0	46.7	76.3	66.7	72.2
Gladiator	36.7	96.7	99.0	33.3	66.4
Gorilla	53.3	90.0	86.3	40.0	67.4
Green Towers	40.0	60.0	89.3	53.3	60.7
Heart's Delight	56.3	50.0	92.7	13.3	53.1
King Henry	63.3	80.0	33.3	26.7	50.8
Lobjoits	73.0	86.7	92.7	20.0	68.1
PIC 454	40.0	84.7	86.3	26.7	59.4
Paris Island Cos	66.3	70.2	73.2	73.3	71.4
Ruebens Red	93.0	82.9	99.0	73.3	86.6
Siskyou	16.7	66.7	66.3	0.0	37.4
Sunbelt	10.3	90.0	96.0	33.3	57.4
Triton	66.3	81.1	76.3	33.3	64.3
Valmaine	76.7	70.0	80.0	53.3	70.0
Mean	58.9	76.1	81.1	41.1	64.4

Table 3. **Leaf Lettuce**: percent of plants with Tipburn tested in Salinas, California and Yuma, Arizona (adapted from Jenni and Hayes, 2010 *in* Smith, Hartz and Hayes, 2011).

Variety	California		Arizona		
	Salinas		Yuma		
	2005	2006	2005	2006	Mean
Green Leaf					
Big Star	1.0	13.3	82.7	40.0	34.3
Envy	73.0	33.3	76.7	26.7	52.4
Genecorps Green	56.7	50.0	92.7	93.3	73.2
Grand Rapids	99.0	60.0	96.0	73.3	82.1
Green Vision	36.7	66.7	89.3	80.0	68.2
Ocean Green	43.3	40.0	79.7	53.3	54.1
Shining Star	13.7	33.3	86.3	53.3	46.7
Tehama	51.1	53.3	99.0	33.3	59.2
Two Star	60.0	36.7	96.0	66.7	64.8
Xena	60.0	75.0	63.3	6.7	58.0
Mean	49.5	46.2	86.2	52.7	59.3
Red Leaf					
Aragon Red	63.3	100.0	99.0	93.3	88.9
Deep Red	69.7	23.3	99.0	93.3	71.3
New Red	59.7	36.7	79.7	86.7	65.7
Red Fox	1.0	93.3	69.7	13.3	44.3
Red Line	63.0	93.3	89.7	86.7	83.2
Red Tide	20.3	40.0	92.7	33.3	46.6
Mean	46.2	64.4	88.3	67.8	66.7

PACA – A VALUABLE TOOL FOR GROWERS

Gary Nefferdorf
PACA Branch
Fruit and Vegetable Programs
Agricultural Marketing Service
U.S. Department of Agriculture

Your crop is harvested and ready to market. Getting to this point hasn't been easy—you've endured sleepless nights worrying about weather conditions, bank loans, and spray schedules. You've spent thousands of hours working tirelessly to ensure that your crop is top quality and will provide the best return on your investment. But until you've actually received payment for your hard-earned labors—and the checks have cleared the bank—all of your time and effort has been for nothing.

Producing a crop is only half the job. The rest involves marketing. Too often, however, growers encounter a myriad of difficulties when selling and marketing their produce. Some of the more common dilemmas include buyers who arbitrarily "clip" invoices—or don't pay at all; loads that get rejected at destination without justification; and sales agents who don't properly account for sales and expenses. Any of these can put your entire business at risk. But whom can you turn to when problems like these arise?

PACA Can Help

The Perishable Agricultural Commodities Act, or PACA for short, protects growers, shippers, distributors, and retailers dealing in fresh and frozen fruits and vegetables by prohibiting unfair and fraudulent trade practices, and by providing a forum that growers and others can use to settle commercial disputes. PACA is administered by the U.S. Department of Agriculture and is funded almost entirely by license and complaint fees that are paid by companies that buy, sell, or broker commercial quantities of fruits and vegetables. This license requirement is what makes the law so effective. USDA can suspend or revoke the license of firms that don't abide by the law, and hold them liable for any damages that result. Naturally, the type of penalty issued depends upon the seriousness and nature of the violation.

Dispute Resolution

What should you do if you encounter problems getting payment from a buyer, or believe that you have suffered damages resulting from unfair trade practices? Your first step should be to call a USDA PACA Branch office to discuss the matter. PACA Branch representatives provide expert, unbiased assistance—whether this involves interpreting a contract term, analyzing an inspection result, or merely providing advice regarding

your rights and responsibilities. Frequently, timely guidance is sufficient to avoid any further action on your part. There are instances, however, when disputes are not so easily settled. In those cases, you'll need to file a claim with a PACA office.
To file a claim, simply submit a letter to any PACA Branch office outlining who you are filing against and the nature of your complaint. Along with your letter, you will need to send copies of any supporting evidence such as invoices, broker's memoranda of sale, accountings, or other paperwork. Also, keep in mind that you must file your claim within 9 months of date that payment became due, or the date that performance of the contract was required. The cost of filing a claim is only $100.

Once the PACA Branch office receives your complaint, they will gather the relevant facts from all parties involved in the dispute and assist in reaching a settlement. The PACA Branch handles more than 2,000 such cases each year. We resolve about 91 percent of these claims informally, generally within four months. However, if informal settlement is not possible, USDA will issue a binding decision and order. Although it costs an additional $500 to obtain a formal ruling, you can recover this fee from the other party, if you prevail.

Sales Agents

Many growers hire sales agents to sell and market their crop. Although arrangements vary, agents typically receive a percentage of the sales price as their commission, and may also be entitled to deduct other expenses. The PACA requires that agents outline the duties and responsibilities of both parties in writing before the first lot is received. In addition, agents must issue you accurate accountings documenting the sales prices obtained and the expenses deducted from each transaction. Agents are generally required to submit these accountings in 10-day intervals throughout the season, and must promptly pay you the net proceeds due once payment is collected. If you believe your sales agent has not met its responsibilities, you should speak to a PACA Branch specialist. If necessary, you can file a claim and a PACA Branch representative will audit the agent's records to determine whether any additional proceeds are due.

Mediation Service

Mediation is an effective way to resolve disputes, since it places the resolution of the dispute directly in the hands of the interested parties. It provides an outlet for settling differences outside of the legal system, strengthens business relationships, and provides a forum where both parties can air their differences in a neutral atmosphere. All PACA Branch personnel that handle disputes are trained in mediation, and can mediate your dispute upon request provided both
parties are agreeable. Mediation sessions can be held face-to-face or over the telephone. Furthermore, there is no additional cost to mediate a dispute beyond the initial $1000 filing fee. To obtain more information about this service, or to arrange for mediation of a dispute, you can contact any PACA Branch office.

Trust Protection

PACA's dispute resolution and mediation services are important tools that produce businesses can utilize to resolve disputes that sometimes occur between trading partners. But what can you do when a customer owes you money and then goes out of business or files bankruptcy? The PACA trust provision requires that dealers maintain a statutory trust on fruits and vegetables received but not yet paid for. In the case of a business failure, the debtor's trust assets are not available for general distribution to other creditors until all valid trust claims have been satisfied. Because of this, suppliers that file for trust protection have a far greater chance of recovering money owed them when a buyer goes out of business.

To preserve your trust rights, the PACA requires that you, within 30 days from the payment due date, provide to the debtor a written notice stating your intent to preserve your trust rights, including in the notice information about the unpaid transaction. Since specific information is needed for the notice to be valid, it would wise to call a PACA Branch office and speak with a representative before you prepare your notice. The requirement for providing written notification to the debtor applies to all who want to preserve trust rights, whether they are a PACA-licensed firm or an unlicensed grower. If you have a PACA license, however, the law allows you to automatically file for trust protection simply by including the following wording on your invoice:

> **"The perishable agricultural commodities listed on this invoice are sold subject to the statutory trust authorized by section 5(c) of the Perishable Agricultural Commodities Act, 1930 (7 U.S.C. 499e(c). The seller of these commodities retains a trust claim over these commodities, all inventories of food or other products derived from these commodities, and any receivables or proceeds from the sale of these commodities until full payment is received."**

The PACA law is here to ensure fairness and offers many services to assist you. For additional information, call any PACA Branch office or visit our website address at http://www.ams.usda.gov/paca, or call our offices at **800-495-PACA (7222).**

SOIL FERTILITY

SESSION

RESTORING SOIL QUALITY IN THE FIELDS OF AGRICULTURE: EVALUATING SOIL HEALTH WITH THE SOLVITA® SOIL TEST

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Soil quality is defined as the capacity of soil to function for different uses, such as a medium for plant production (commonly measured as yield), in the regulation of water flow in the environment, and in the recycling of organic residues. Implicit in the concept of agricultural and environmental soil quality is the goal of ecosystem sustainability.

Soil quality has intrinsic and dynamic components. Soil mineralogy and soil texture (percentages of sand, silt, and clay) are intrinsic properties that affect a soil's ability to function, but they are not easily altered. On the other hand, soil pH and nutrient status is commonly managed by soil amendments; these are dynamic characteristics of soil quality. Maintenance of the "health" of the soil, sustaining its functions, is a goal of good land management.

As with many issues, there are sometimes mixed consequences of management; for example, tillage can be beneficial for creating a uniform seedbed, managing weeds, and breaking up surface crusts or compaction, but in the long run may cause loss of organic matter, destroy soil structure, and lead to deep compaction. The specific conditions of soil type, site features, management activities, and other factors will influence the relative degree of change, but it's valuable to understand the tendency of response even before the change is apparent because of the slow rate of change.This is especially true for soil organic matter content, a property recognized as critical to soil quality. Organic matter is important to soil fertility, water holding capacity, soil structure and strength (resistance to deformation anderosion), and biological populations.In natural, undisturbed sites, soil tends to achieve an equilibrium level of organic matter, balancing the inputs of organic residue and the losses by decomposition. Long-term intensive agriculture can deplete soil organic matter and lead to degraded soils, requiring ever more inputs to maintain production. The changes may be relatively slow and masked by other variations; only after long term may the negative effects be revealed or scientifically documented. Therefore it is important to evaluate changes in organic matter content (and related properties) as a function of soil management and timeto guide decision-making in the short term.Implementing strategies to restore organic matter to depleted soils will provide benefits in terms of nutrient availability, water-holding capacity, buffering capacity, and longer-term development of soil structure. The results can be attributed in part to revitalizing the soil ecology.
Other indicators of soil quality for agriculture include soil pH and fertility, chemical

properties that are easily measured in the laboratory (thanks to many years of research and calibration by agronomists). Physical properties are also evaluated by standardized procedures in the field and in the laboratory, though these are not often utilized as a management tool in traditional production agriculture. The biological property of soil most often considered is relative yield, the eventual result of the crop's response to soil quality. Other populations of the agro-ecosystem are often overlooked, and rarely is there an attempt to evaluate the soil microbial population.

However, the Solvita® soil test (Woods End Laboratories, Mt. Vernon, ME),a relatively new procedure for assessing overall soil biology, has been gaining attention. It is performed under controlled conditions of the laboratory using a standard soil testing sample (dried, ground, & sieved) and uses a measure of respiration (production of CO_2 by biological metabolism) to reveal the relative activity of soil microorganisms. A soil sample is placed in a container with holes in the bottom to allow water to wick up; the amount of water will depend on the physical properties of the soil. Placed in an air-tight jar, a paddle with a CO_2-absorbing gel is inserted with the soil to absorb the product of soil respiration within the jar as the microbes are revived with the re-wetting step and become active. The special feature of the CO_2-sorbing gel is that it changes color as the concentration of CO_2 increases, and so color can be measured and calibrated to amount of CO_2. So after a standardized period of incubation, the paddle (gel) is read with a digital color reader or compared to color charts to determine the CO_2 production by soil microbes.Research reports supporting the concept of the Solvita® system are available in scientific journals and through the Woods End Laboratories website.

This test was used in recent research by Rutgers soil scientists demonstrating the practice of organic amendment to agricultural soils.Although other physical and chemical indicators, including organic matter content, failed to detect differences across treatments, greater yields and higher levels of biological activity measured in the amended plots confirm the positive effects of organic matter addition to soil.Biological response can be related in this case directly to the amount and quality of the organic matter added, which is a food source for the microbes. The improvement in biological indicators suggests that amendment of plots would eventually lead to measurable improvement inother indicators of soil quality.A longer period of time is required to detect those improvements in soil structure and related properties.

Further work with the Solvita®soil respiration testrelates to the nutrient recycling that results from the microbial metabolism of organic matter. In particular, nitrogen is released and available to contribute to crop nutrition.Since organic matter decomposition is the primary nitrogen source in natural (unfertilized) ecosystems, microbial decomposition is essential for nutrition of non-legume plants. Therefore, measurement of soil respiration is a potential tool to predict availability of nitrogen, the essential element not typically measured in a routine soil test. To be able to accurately credit nitrogen from organic matter sources applied to agricultural fields against the suggested total nitrogen recommendation would be a valuable contribution to economical and sustainable farm management.

MAKING COVER CROPS WORK FOR EARLY SPRING VEGETABLE PRODUCTION

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Introduction: Early spring vegetables such as spinach, lettuce, peas, beets, onions, early sweet corn and kohlrabi can be hard to establish in the Mid-Atlantic, where cool, wet soil conditions often predominate. Because many traditional cover crops such as rye and oats exacerbate the problem of cool, wet soils in spring, they are logistically and economically unfavorable. Our current research aims to develop systems for early vegetable production that utilize alternative cover crops—low-residue, winterkilled cover crops—such as forage radish, to facilitate no-till, no-herbicide early spring planting of vegetables.Forage radish is of primary interest because of its known favorable attributes, including nearly complete early weed suppression, warmer, drier, more friable seedbed at planting time (see Figure 1), and early residue decomposition and nutrient cycling. We are also investigating other low-residue, winterkilled cover crops such as phaceliafor their potential in early spring vegetable production. Preliminary results suggest that forage radish enables early planting in a wet spring and is especially effective prior to spinach.

By eliminating the need for spring tillage and a burndown herbicide, these systems provide cost and time savings to all farmers, and open the door to no-till planting of early vegetables for organic growers who are not permitted to use herbicides. Additionally, the recycling of nutrients and early mineralization of N in spring provide fertilizer savings and environmental benefits.

Forage radish (*Raphanussativus*) cover crop: A thorough fact sheet about forage radish is available from the University of Maryland Cooperative Extension: http://extension.umd.edu/publications/pdfs/fs824.pdf**.** The myriad benefits of forage radish include: ability to alleviate soil compaction by “biodrilling”, high nutrient content (N,P, S,Ca, B), a deep taproot that alleviates soil compaction, creation of a friable, residue-free seedbed and suppression of early spring weeds. The combination of these traits is unique, and while phacelia shows promise, many other common cover crops that decompose rapidly lack the important weed suppressing capability of forage radish. With regards to using forage radishin no-till, no herbicide spring vegetable production, importantpoints are:

- ***Planting date***: In order to provide adequate weed suppression in spring, forage radish must be planted by the first week in September in the Mid-Atlantic.
- ***Planting rates and methods****:* Forage radish can be drilled or broadcasted and will germinate within three days with sufficient soil moisture. Suggested

seeding rates are 5-6 lbs/acre with precison planters, 8-10 lbs/acre drilled, and 14 lbs/acre broadcasted. Some vegetable farmers have planted forage radish with their vegetable seeders using a radish or beet plate. This can allow for spring seeding in the same rows or directly next to the radish rows. Density can be variable; larger spacing will produce larger roots. Generally, 3-5 plants/ $ft^2$is desirable. Forage radish can be planted as deep at ¾" if soil moisture is limited.

- ***Fertilization at planting***: Most fields that have been in vegetable production will have enough N in the topsoil to get the forage radish cover crop started, after which it will scavenge N from deeper in the soil profile. However, if planting forage radish in a field that does not have a history of manure application or is coming out of grain production, 25 lbs/acre N may be necessary to get forage radish started.

Vegetable response to forage radish: Preliminary results from 2011 indicate that spinach germination and growth following radish is greater than that following no cover crop, oats and a combination of radish and oats. Farmers have indicated that beets also have increased germination and yield following forage radish. Thisis in line with the observation that lambsquarter, in the same family, is one of the few weeds that shows an increased abundance following a forage radish cover crop. The weed pressure on an individual farm must be taken into consideration in light of this fact. We hypothesize that members of the Allium family may also respond positively to forage radish, which is high in both N and S contents, and trials are underway with garlic.

Phacelia(*Phaceliatanacetifolia)*cover crop: Phacelia is a native of the Southwestern US and is popular as a cover crop and insectiary in Europe. There were promising results using phacelia as a cover crop in the northeast in the 1990s, but the price of seed was prohibitively expensive. Seed prices have come down and are now ~$4/lb (seeding rate-15-25 lbs/acre). Phacelia has an even narrower C:N ratio (8:1) than radish and our lab studies show it mineralizes N even more quickly than radish. We have not yet observed the weed suppression in spring following phacelia, nor the friability of the seedbed.

Conclusions: Much is known about forage radish as a cover crop, and it has been widely adopted within agronomic systems in the Mid-Atlantic, mainly for its compaction-alleviation benefits and nitrogen capture ability. It shows great promise for use in vegetable production, especially with members of the spinach family. Utilizing it alone or in cover crop mixes can be a valuable tool for early spring vegetableproduction. The investigation of other cover crops with similar traits, but outside of the Brassica family is needed for farmers who cannot fit more Brassica species into their crop rotations.

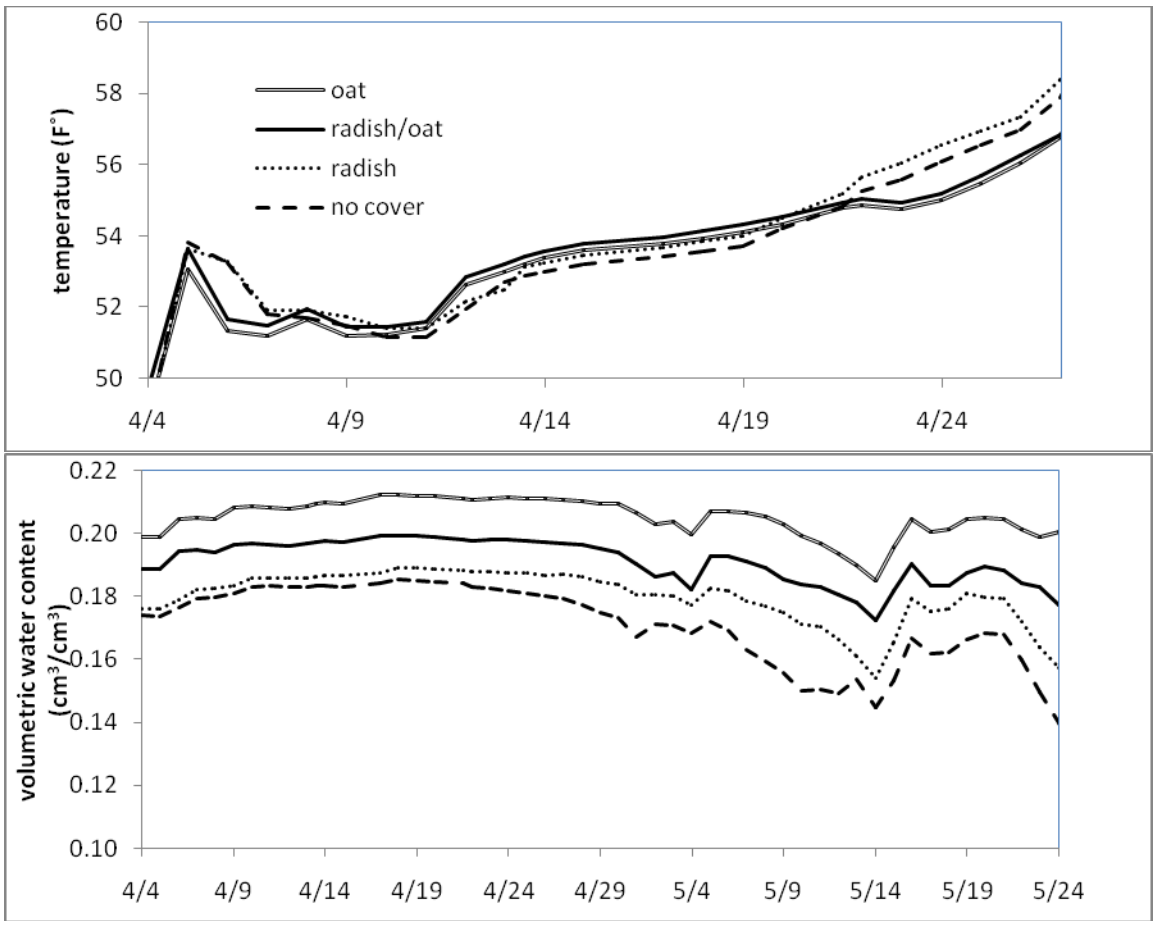

Figure 1: Temperature and volumetric water content of untilled loamy sand soil in spring (note different time periods) following cover crops.

SILICON FOR SOIL FERTILITY AND PLANT NUTRITION

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Regular applications of liming agents are needed to maintain a desirable soil pH level and adequate supply of calcium and magnesium fertility. The recommended soil pH for most vegetable crops is about 6.5.

Our research over the last decade has compared two different types of agricultural liming materials for a variety of crops grown in rotation. Common agricultural limestone, chemically referred to as calcium carbonate, was compared with calcium silicate in a field with an initial soil pH of 5.9 at the Rutgers Snyder Research & Extension Farm. Findings from this research demonstrated the advantages of using calcium silicate as a liming material in place of agricultural limestone.

Calcium silicate is an alternative liming material that supplies the nutrient silicon in a plant available form. The calcium silicate product used in our field research is a by-product of the steel industry. Commercially the product is called AgrowSil. In addition to silicon, this product also supplies calcium, magnesium, and some micronutrients.

In our field trails we found that calcium silicate and calcium carbonate are equally effective at neutralizing soil acidity and raising soil pH. The cost of both types of liming materials is about equal. Calcium silicate, however, has the additional benefit of providing enhance silicon nutrition to crops.

Silicon is a valuable plant nutrient with beneficial effects on disease suppression and stress tolerance. Powdery mildew is a common disease problem with pumpkin and weekly fungicide applications are generally used to achieve control. Although silicon amendment of soil does not completely prevent powdery mildew, it can delay the onset of the disease. Our field trial showed that calcium silicate can increase pumpkin yield even when no fungicide is used.

The most useful observation from our research with calcium silicate amendment of soil is that it may reduce the need for fungicide application. This lowers the cost of crop production. Ideally this soil fertility approach to disease management should be combined with integrated pest management (IPM).

Our research also showed that liming soil with calcium silicate benefited crops in the rotation after pumpkin. On field corn, increased silicon uptake in the stalk was associated with less injury from European corn borer. On winter wheat, increased silicon uptake was associated with suppression of powdery mildew disease and increased grain yield.

HOW TO GROW VEGETABLES WITHOUT SIDEDRESS NITROGEN

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The high cost of commercial fertilizer provides reason enough for wanting to grow crops without sidedress N. Beyond producing the current crop, the application of commercial N fertilizer does virtually nothing for the longer term goal of soil quality. The adoption cultural practices that can offset the need for commercial N will help to achieve many other agronomic benefits. “Grow Your Own N” using crop rotation and legume cover crops serve multiple functions. These include building soil organic matter content, drought resistance, preventing soil erosion, and breaking pest cycles.

Adding diversity to the crop rotation plan, like growing, alfalfa or other forage legume crops is a very effective way to supply fertility to N demanding crops. This approach works for satisfying the N needs of rotation vegetables. Sweet corn, like field corn for grain, often can be grown after an alfalfa rotation without any further need for N.

Understandably, some vegetable growers do not want to become producers of hay crops. In that case they may grow legume cover crops that are grown primarily as a means to supply biologically fixed N. Hairy vetch, grown as the N fixer, along with a little rye, makes an excellent cover crop combination which can in many cases solve the N deficit problem. The combination also works well with a roller crimper, as demonstrated at the Rodale Institute, for no till production. One advantage of hairy vetch and rye is that they can be gown as winter cover crops. However, the spring kill step for this cover crop must be late enough to ensure that adequate N has accumulated. There are a variety of other cover crops that may be grown in association with vegetable crops. However, they have the downside of consuming land area while not being a cash crop.

There in lies that value of growing hay crops that can feed both livestock and the soil. Livestock utilize the forage legumes and provide a supply of manure which is an excellent fertilizer for vegetable crops provided it is handled correctly. In New Jersey only about 14% farm gate revenues come from sales of livestock, dairy, or poultry products. This percentage revenue stream from animal products places New Jersey near the bottom among states. Expanding opportunities for livestock farming, especially forage-based production systems, can improve the sustainability of agriculture. It also provides for marketing advantages. Thus, we should look for opportunities to integrate livestock with vegetable farming.

Building soil N by such practices should be used along with soil N testing to insure that N supply is adequate for the vegetable. Instructions on how to do N testing are on web: http://njaes.rutgers.edu/pubs/publication.asp?pid=E285

FOOD SAFETY

SESSION

IRRIGATION WATER TEST RESULTS FROM PENNSYLVANIA

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In January of 2011, the U.S. Congress passed the Food Safety Modernization Act. This new law can be expected to considerably change how we assure that the food we grow, pack, process, and distributeis safe to eat. Although the Act broadly covers all components of the food system, of great importance to growers is new authority granted to the Food and Drug Administration (FDA) to issue farm food safety standards, known as Good Agricultural Practices (GAP), to produce growers. These include worker hygiene practices, livestock and wildlife control, use of raw and composted animal manures, pre- and post-harvest field, facilities, and equipment sanitation, and the microbial quality of water used to irrigate crops.There are exemptions for smaller farms that market products directly to consumers, grocery stores, and restaurants. However growers who sell through indirect wholesale markets such as cooperatives, distributors, and produce auctions can expect to fall under the law.

The quality of agricultural water is of particular of concern since it has the potential to spread localized contamination rapidly and unexpectedly over great distances. The type and amount of microorganisms in water used for irrigation strongly affects the potential for crop contamination. Growers who use surface water(e.g. rivers, streams, ponds) to irrigate their crops need to regularly monitor microbial levels since these are likely affected by environmental factors such as runoff from neighboring animal operations, nearby septic systems, and animal intrusion.

Standards for the microbial quality of irrigation water are already used by third party auditors who inspect farms selling to wholesale buyers. However they are often vague about what microorganisms to test for, how often testing should take place, and what microbial levels indicate an unacceptable risk. Populations of actual human pathogens are rarely determined since such tests require specialized equipment and complex methods that make quantification expensive and time consuming. Instead, indicator microorganisms are usually determined. Indicator organisms are individual species or categories of microbes that tend to originate from the same source as pathogens but do not by themselves cause illness. To be useful, they should be inexpensive to quantify, require simple and rapid methods for analysis, and their levels in any particular water sample should be proportional to the amount of pathogens present.

There is no universal standard for irrigation water nor has the ideal indicator organism been identified for reliably predicting the presence of pathogens in surface water.

However, pending further studies, several standards areused to estimate water safety risk. National drinking water standards require that water for human consumption be free of coliform bacteria. This is reasonable for municipal water since their presence strongly suggests that some sort of contamination occurred after the water was treated to make it safe. Coliform bacteria levels in well water can reliably predict excessive percolation of bacteria laden surface water into the ground water source, or that the structure of a well has been compromised such that soil bacteria are able to leak through the casing wall and into the water. However coliforms poorly predict the presence of actual disease causing organisms since most species of bacteria in this category are harmless soil microorganisms. Another category, fecal coliforms, also has its shortcomings as an indicator organism. Despite its name,this bacterial group can alsobe a poor predictor of fecal contamination since it too contains many harmless soil bacterial species.

Perhaps the most reliable indicator of unsafe water that we have available is the bacterial species *Escherichia coli*, also simply called *E. coli*. This type of bacteria is included in the coliformsand fecal coliforms group. However it is considered a more precise measure of food safety risks since itsultimate source is the intestinal tract of animals and humans where itgrows to extremely high levels. A link between *E. coli* and the presence of human pathogens can be established since both find the human gut to be an ideal growing medium. *E. coli* is also a fair indicator of recent contamination since it does not survive for long periods of time in the soil as do many harmless coliforms. Some strains of *E. coli*are harmful. The most notable one that we read about in the newspapers is*E. coli* O157:H7 which can cause serious illness and even death if only a few cells are ingested. But most *E. coli*are harmless. In fact beneficialstrains are essential in the human gut to crowd out disease causing pathogens while producing vitamins that we need to keep healthy. So even *E. coli* is not a perfect indicator of the presence of human pathogens.

Definitive data on which microbesor microbial categories are the best predictorsof the safety of water used to irrigate fruits and vegetable are lacking. Nevertheless, several standards have been established by auditing agencies including some for levels of coliforms or fecal coliforms in surface water. But the strong association of *E. coli*with fecal contamination makes this indicator organism the most widely used predictor of elevated food safety risks.Most often proscribed as an upper limit is the U.S. Environmental Protection Agency (EPA) beach water standard of no more than 126 *E. coli* cells in a 100 ml sample. Some state departments of health have also mandated a limit of 200 fecal coliforms in a 100 ml sample.

Data on microbial levels in surface waters used to irrigate fresh fruits and vegetables is lacking and feedback after GAP training workshops we have conducted indicated that growers were unsure of which test they should use or what standard to apply. Therefore, in June of 2010, we initiated a study to survey microbial populations in surface waters used for irrigating Pennsylvania fresh produce crops. Samples were taken from 33 locations at three separate times during the growing season for

enumeration of indicator microorganisms (aerobic plate count, fecal coliforms, coliforms, and *E. coli*) and the human pathogens *E.coli* O157:H7 and Salmonella. Physical tests included pH, conductivity, air and water temperature, turbidity, and dissolved oxygen. Data was also collected on grower practices and environmental factors (upstream water use, nearby animal activity, water flow, precipitation levels three days prior to sampling) that may affect the potential for water contamination. Results from the 2010 survey revealed that 66% of the samples collected would have failed an *E. coli* standard and/or a fecal coliform standard. We repeated the study in 2011 and similar results were found. Results showed that 63% of the samples collected would have failed an *E. coli* standard and 70% of samples would have failed a fecal coliform standard. Work is in progress to confirm the identity of presumptive pathogens and to statistically analyze the 2010 and 2011 data to determine if indicator microorganisms and current surface water microbial standards are useful predictors of the presence of pathogens.

When the FDA issues its produce safety standards in early 2012, we can expect microbial standards for safe use of irrigation water to be a big issue. It is likely that the EPA *E. coli* standards,or something similar to it, will become mandatory. This is especiallylikely for water applied by overhead irrigation methods where it actually contacts the edible part of the crop. Our results show that some growers may have difficulty in meeting this standard. Therefore, further research will be needed to determine to what extent switching to drip irrigation methods reduces food safety risks and if practical and cost effective disinfection treatments can be used to lower *E. coli* levels.

Once the draft produce standards are issued, growers will have an opportunity to comment on them. Keep in touch with your local extension office for information on how you can contribute to the regulation writing process.

TRACEABILITY IN THE PRODUCE INDUSTRY

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Find following a summary of the presentation I will be giving on Tuesday, January 17, 2012 at the Atlantic Coast Agriculture Convention and Trade Show.

What is the PTI (Produce Traceability Initiative)?

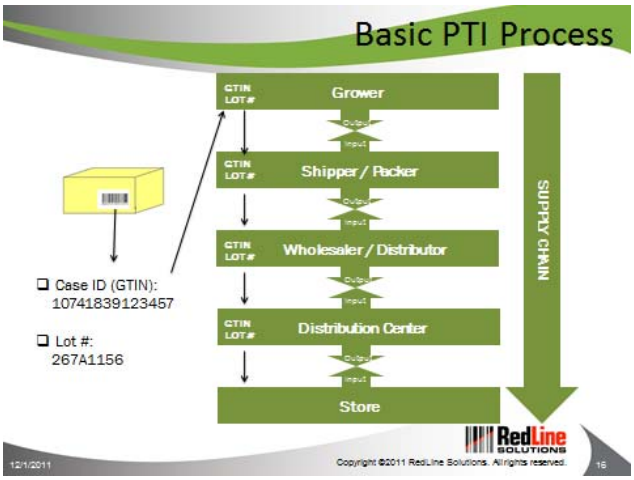
- Industry-wide standard initiative
- Created in 2009
- Sponsored by PMA, UFPA, CPMA, GS1
- Aimed at creating whole-chain traceability using:
    - Existing standards (GS1 standards)
    - Existing technologies (barcodes)
    - Existing information (GTIN and Lot/Batch #)
    - Existing systems (use your own system)
- Case-level tracking (NOT item-level)

GS1 Standards Used

- Case number (GTIN – Global Trade Item Number)
- Pallet number (SSCC - Serialized Shipping Container Code)
- Barcode – GS1-128 barcode (holds up to 48 characters of information)

PTI Milestones

- Milestone #1 – Obtain GS1-issued Company Prefix
- Milestone #2 – Assign GTINs to your case configurations
- Milestone #3 – Communicate your GTINs to your trading partners
- Milestone #4 – Human readable information onto case
- Milestone #5 – GTIN and Lot/Batch # encoded in case barcode
- Milestone #6 – Read and Store INBOUND case information
- Milestone #7 – Read and Store OUTBOUND case information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LOT #
Grower
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Input
Shipper / Packer
Wholesaler / Distributor
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Store
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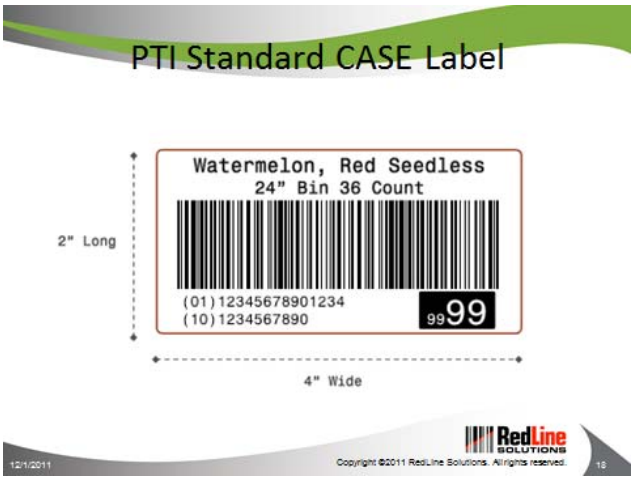
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(10) 1234567890
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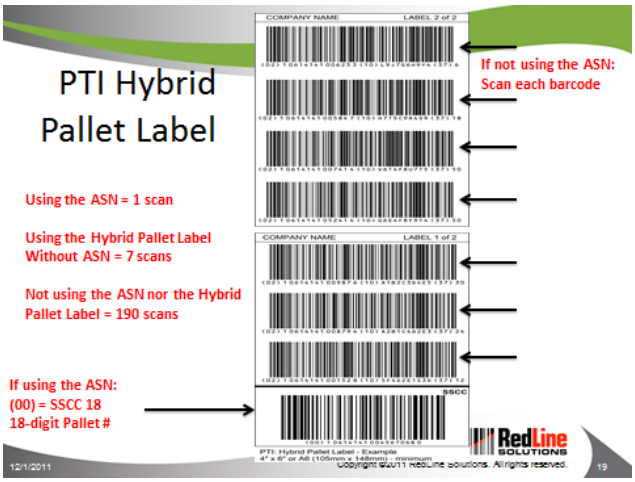
PTI Hybrid Pallet Label
Using the ASN = 1 scan
Using the Hybrid Pallet Label Without ASN = 7 scans
Not using the ASN nor the Hybrid Pallet Label = 190 scans
If using the ASN:
(00) = SSCC 18
18-digit Pallet #
If not using the ASN:
Scan each barcode
COMPANY NAME
LABEL 2 of 2
LABEL 1 of 2
SSCC
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Why the PTI?

- Makes logical sense
    - Tracking level (Item, Case or Pallet)? **CASE** (every supply chain member uses CASE, not so with item or pallet)
    - Track information Manually or Automated? **AUTOMATED** (manually would bring industry to a crawl)
    - Which form of automation (RFID or Barcodes)? **BARCODES** (already established and used in about every distribution center)
    - Which barcode? **GS1-128** (largest implemented barcode standard in world)
    - What information should be on CASE? **GTIN** (to identify contents of case) and **Lot/Batch #** (needed to track back to source)
- Already being used in the Food Industry
    - Traceability Initiatives occurring in the following industries:
        - Produce (PTI – Produce Traceability Initiative)
        - Meat/Poultry – Meat and Poultry Traceability Guidelines
        - Seafood – Seafood Traceability Guidelines
        - Foodservice – Foodservice GS1 US Standards Initiative
    - Common elements of all traceability initiatives:
        - Case identification # = GTIN
        - Pallet identification # = SSCC
        - Barcode used for case and pallet = GS1-128 barcode
        - Key traceability components = GTIN and Lot/Batch #
- LEAST expensive system
    - Not FREE
    - Not EASY
    - BUT:
        - Uses existing standards (GS1)
        - Uses existing technologies (Barcodes)
        - Uses existing information (Case ID and Lot/Batch #)
        - Uses existing systems (you can use your own system)

TRANSPLANTS

SESSION

TRANSPLANT PRODUCTION IN FLORIDA

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An increasing percentage of vegetable crops in Florida are grown from transplants. The primary reasons for the increasing use of transplants are the rising cost of hybrid seed and a quest for earliness.
For commercial producers, a "good" vegetable transplant should be stocky, green, and pest-free with a well-developed root system. Once transplanted, the plant should tolerate environmental challenges and continue growth to optimum yield. Overly hardened or under-fertilized transplants may not establish quickly, which can lead to delayed maturity and reduced yields.

The "ideal" technique for growing transplants involvesraising the plant from start to finish by slow, steady, uninterrupted growth and with minimal stress. Since ideal growing conditions rarely exist, plant growth may need to be controlled through the manipulation of water, temperature, and fertilizer.

A number of issues need to be considered in the production of vegetable transplants. Subjects will include greenhouses, soilless media, containers, seed, irrigation, fertilization, shipping, and crop specifics.

Structures: Due to the relatively mild weather conditions that persist throughout the year, most vegetable transplant “greenhouses” in Florida are a modified Quonset-style, with metal trusses and metal or wooden sidewall support structures covered with polyethylene film. These are equipped with movable sidewalls (often called curtains) can be moved up (opened) to allow cross ventilation or down (closed) to conserve heat and provide protection from wind and rain. This style of construction is inexpensive and allows for optimal cooling.

Benches:Florida vegetable transplant growers do not use traditional benches. Instead most growers use the T-rail system for bench construction. The transplant flats are slid between (and supported by) pairs of the T-rails.

Tray or Flats: Although a transplant production trays are available in a wide variety of materials, most growers are using from so-called styrofoam or plastic trays with various cell shapes including inverted pyramid, truncated cone, and assorted beveled shapes. Cell size is generally a matter of economics. In crops such as onions or lettuce, where plants per acre number in the tens of thousands, flats with small cells are preferred because more plants can be grown in less space.

Media: Most transplant operations use a commercial, pre-blended, soilless mix composed primarily of varying proportions of peat, perlite, and fertilizer. After seeding, the planting trays may be top-dressed with vermiculite.

Seed: The old adage "Good seed doesn't cost, it pays!" applies in vegetable transplant production. Quality seed insures good germination, rapid emergence, and vigorous growth. In general, vegetable growers provide their own seed to the transplant grower who then produces the desired number of transplants on a contractual basis.

In many cases, pellitized seed is used for ease in mechanical seeding. Pelletizing increases speed of seeding and allows singulation within the flat (one seed per cell). Fungicides and fertilizers may also be incorporated into the coating.

Irrigation: The majority of Florida vegetable transplant production rely on overhead irrigation which employ automated watering systems which move the length of the house on elevated tracksand irrigate via a boom system, which are typically equipped with an additional boom for pesticide application.

Knowing when to water is generally determined by experience. Water requirements change as plants grow and with varying weather conditions. Seed should be kept moist but not wet, for optimal germination. For established transplants, water should be applied only when the surface of the medium is dry to the touch. Excessive watering leads to succulent plants with restricted root growth.

Water management is the major technique used to control plant height, but too little or too much water will result in problems.
Overhead irrigation is typically done in the morning, to allow the foliage to dry before night. Prolonged periods of wet foliage encourage disease.

Fertilization: The goal in vegetable transplant production is to produce a sturdy, compact plant that when transplanted will establish and grow quickly and produce an optimum yield. A good rule of thumb is to begin fertilization only after the first true leaf has expanded.

No fertilizer formula covers all transplant crops or all environmental conditions. Growers generally develop their own blends and application schedules. The majority of growers prefer to apply nutrients through liquid fertilization to provide for "greater control" of plant growth. Should leaching of fertilizer be necessary to slow excessive growth, liquid fertilizers are more easily washed out of a mix than are granular fertilizers.
Excessive fertilization, especially early in transplant growth, will result in "leggy" plants that may defoliate and establish slowly in the field. Minimal fertilization will result in stunted plants with retarded growth in the field. Proper fertilization directly impacts field performance.

Hardening: Most transplants will be sufficiently hardened for field setting if water and fertilizer are used judiciously to maintain plant height. However, additional hardening can be accomplished by reducing the irrigation. Growers typically harden plants by letting them acclimate to "new" conditions, beginning about one week before anticipated delivery. Over-hardening can result in slow field establishment and reduced yield.

Pest and disease control: Strict sanitary practices are the foundation of an effective pest and disease management program and should be followed in the greenhouse. Touching and handling transplants should be minimized and avoided unless necessary. Spray bottles containing an approved sanitizer should be used frequently to sterilize hands if plants and flats need to be handled. Use only clean tools and uncontaminated or sterilized materials when filling flats. Spray growing areas with chlorine solutions or other sanitizers (according to label specifications) after production to sanitize benches, walkways, and so forth. Reuseable flats should be sanitized with steam and/or chlorine solutions between uses

Extended periods of leaf or soil wetness can lead to disease, so avoid over-watering. Foliage should be dry by nightfall. Ventilate the house to keep relative humidity down and, if necessary, provide air movement to dry plants.

Judicious use of registered fungicides and insecticides will reduce the chances of pests developing chemical resistance. Purchasers should be made aware of the pesticide program used while growing the transplants to help in developing their own pesticide strategies for the field.

PEPPERS

SESSION

RED PEPPER VARIETIES FOR SUMMER AND FALL PRODUCTION

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Introduction

There has been increased interest in the production of colored bell peppers both for the wholesale and retail market. At the request of the pepper advisory committee two studies were established at the Rutgers Agricultural Research and Extension Center, Bridgeton, NJ to compare the yield and horticultural characteristics of varieties for summer and fall production.

Materials and Methods

Culture: Eighteen varieties were transplanted in a summer trial (May 23) and a fall trial (July 1) from 128 cell trays containing peat-vermiculite media. Plants were set with a water wheel transplanter on raised beds with black plastic mulch and one drip line per bed. Each plot was 15 ft long with 5 ft between beds, 18 inches between plants,18 plants per plot in double rows 12 inches apart. The plots were arranged in a randomized complete block design with four replications. Plants were staked and tied using the Florida weave system on the first string then running a string on the outside of the plants forming a box around each plot for the second string.

Thirty pounds/acre of nitrogen as calcium nitrate was incorporated prior to bed making. Additional fertilizer was applied through the drip system on a weekly basis at the rate of 3 gal/A 5-0-10 which was supplemented with solubor at 2 lbs/A when the tissue analysis indicated the need for additional boron.

Preplantherbicideapplications of Devrinol, Command and Dual Magnum followed by hand weeding after planting resulted in weed free plots. Admire was applied as a drench to the seedling flats prior transplanting at a rate of 3 ml per flat in sufficient water to saturate the growing media. Fungicides were applied on a weekly basis to reduce the chance of Anthracnose development.Coragen was injected through the drip system followed by insecticide applications as needed for insect control.

The summer trial was hand harvested on August 10, 18, 25 and September 1, 9, 15, 22 and 29. The fall trial was harvested September 9, 15, 22, 29 and October 6, 13, 20 and

28.At the sixth harvest for the summer trial and the fifth harvest for the fall trialfive fruit from each replication were randomly selected from the extra large and large fruit toevaluate for recessed shoulder, lobe number, wall thickness, fruit length and width, fruit color, smoothness, glossiness and uniformity. Fruit size and weight categories wereExtra large (0.5 lbs/fruit or larger), large(0.33-0.49 lbs/fruit), medium (0.25-0.32 lbs/fruit), commercial (slightly misshapen fruit) and culls (0.24 lbs/fruit or smaller and diseased or other problems). Yield is reported in 28 lb boxes/A.

Varieties and breeding lines

Variety/Line	Source	Summer[1]	Fall[1]
Alliance	Harris Moran	X	X
Aristotle	Seminis	X	X
Camelot	Seminis	-	X
Classic	Sakata	X	X
Crusader	Syngenta	X	x
Festos	EnzaZaden	X	X
Hunter	Syngenta	X	X
King Arthur	Seminis	X	X
Paladin	Syngenta	X	X
Patriot	Harris Moran	X	X
Red Bull	Sakata	X	X
Red Knight	Seminis	X	X
Red Start	Stokes	X	-
Revolution	Harris Moran	X	X
Sir Galahad	Semins	X	X
Socrates	Seminis	X	X
Triple 4	EnzaZaden	X	-
Vanguard	Harris Moran	X	X
XPP 6001	Sakata	X	X
1819	Seminis	-	X

X represents in which study the variety was planted.

Results and Discussion

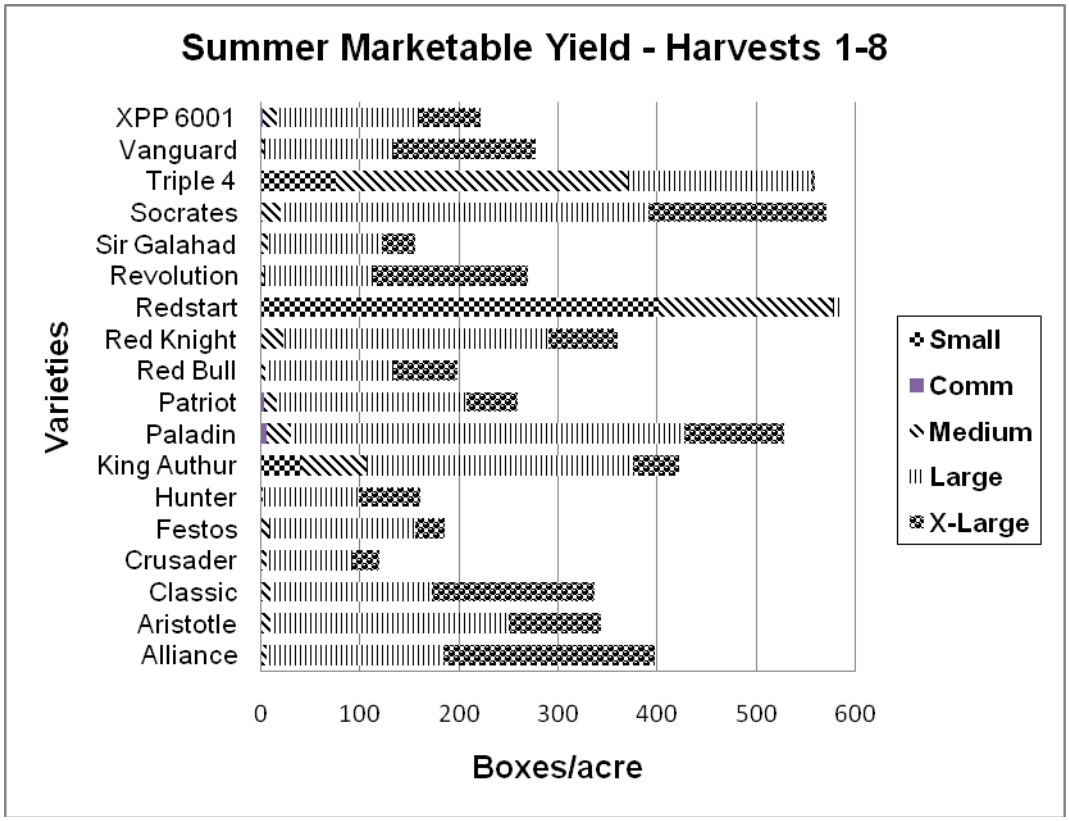
The growing season was noted for contrasts between the summer and fall studies. The summer was hot and dry until August when the research station had over 22 inches of rain. This made it difficult to protect the fruit from disease, but few problems developed since the spray schedule was maintained at a 5-7 day interval. The fall period was warm with no frosts until after the last harvest.

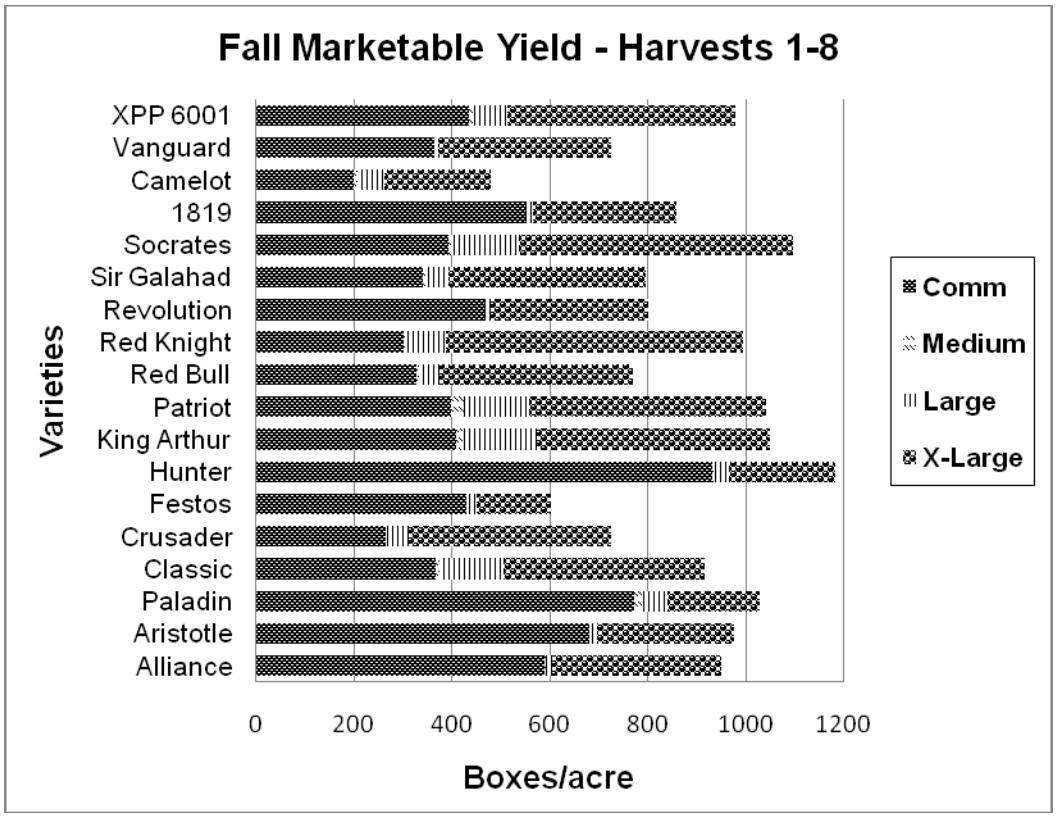
Yields in the summer planting were approximately 50% less than the fall planting. This could be related to the high temperature during most of the growing season. There were more extra-large and commercial fruit in the fall planting compared to the summer planting.

Two varieties Red Start and Triple 4 produced nice early small fruit that would be accept for roadside stands and farmers markets. Socrates, Paladin, King Arthur, Red Knight, Alliance and Aristotle would be worth trialing in another year for summer production. The variety Classic had similar yields as Aristotle, but showed rot and fruit cracking problems.

Planting for fall harvest can be much different than summer plantings. Some varieties exhibit a physiological disorder called black spot or color spot. Black spot appears when temperatures just above freezing occurs for several nights at harvest time. Color spot (green pitting) has been reported in Australia with normal growing temperatures, but was associated with higher than normal calcium content of the fruit. Both are variety related. The varieties which exhibited spotting were Paladin, Classic, Red Bull, Revolution, Camelot (worst), Aristotle, Patriot and Vanguard. This disorder would make the fruit unsalable for the wholesale market.

The other problem observed in the fall study was fruit cracking. This results from nighttime relative humidity near saturation thus the fruit cannot expand rapidly and the fruit cracks. This can be variety related. The varieties observed with cracks were Paladin, Socrates, Aristotle and Hunter. These would not be acceptable for the wholesale trade. Possible varieties to evaluate for fall production include: XPP 6001, Red Knight, King Arthur and Alliance.





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INJECTING INSECTICIDES THROUGH TRICKLE IRRIGATION IN VEGETABLES FOR INSECT CONTROL

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Plastic mulches and drip irrigation have been used by pepper growers since the early 1970's, and their usage is still increasing. Drip irrigation has many benefits, including the capability to conserve water. Water savings can be as much as 80% compared to other irrigation systems. Currently, drip systems are the irrigation systems of choice in many vegetable-producting areas because of their water management efficiency when used in combination with plastic mulch row covers.

As drip irrigation systems developed and became adopted by growers, researchers examined the injection of agrichemicals through the drip irrigation system. The first 'chemigation' trials involving drip irrigation and bell peppers were conducted at RAREC, Bridgeton, NJ, including the injection of fertilizers ('fertigation') in 1979, and insecticides ('insectigation') in 1980-1981 for the control of the European corn borer.

Although drip technologies quickly improved, the insecticides available for use in drip systems were limited and ineffective. In the 1980's and 1990's, there were no insecticides that were root systemic and effective in controlling vegetable insect pests. New chemistry insecticides were needed that were highly soluble (so they would be uniformly distributed through the system without plugging the emitters), root systemic, effective against specific insect pests that attack the fruit or foliage, and safe to the plant (non-phytotoxic) and the environment. It was not until the mid- to late 1990's that insecticides with these qualities were developed, and were thus well-suited for use in drip irrigation systems. Over the past several years, research has shown that insectigation is not only effective for control of specific insect pests of vegetable crops, it is very economical. One to two applications via a drip system is as effective, or more effective, than multiple foliar spray applications in bell peppers, tomatoes, eggplant and other crops. Materials such as imidacloprid (Admire), chlorantraniliprole (Coragen), and thiamethoxam (Platinum) received labels with specific drip-irrigation application instructions for use in vegetables for control of a wide variety of insect pests.

Growers that already use the drip system to inject fertilizers may be all set to inject insecticides. For growers just starting out with injection equipment, a little extra equipment may be required to properly inject chemicals through the drip system. A positive displacement pump or other injection unit that provides a consistent, measurable injection rate is necessary. A back-flow preventer, pressure regulator, and sand filter are important units that should be located between the injection pump and water source. And a pressure reduction shut-off unit should be used to shut the injection pump off should a sudden pressure drop occur, such as due to a hole or break in the drip line.

Uniformity of application is important. It is desirable to have the same quantity of insecticide drip be deposited into the soil from every emitter in the system so that every plant receives the same insecticide treatment. 'Prime' the system before injecting an insecticide so that the dry soils have a normal moisture range before insectigation. Under-watering will prevent the insecticide from reaching the entire root zone of all plants, and overwatering will leach the material from the root zone. The correct timing of the injection period depends on soil type, distance covered, product mobility in the soil, and location of the emitters relative to the root system. Remember that the goal is to deliver the same amount of insecticide to the root zone of all plants equally. Don't rush injection time – extending the length of injection will actually improve the uniformity of delivery.

The rates used in the drip system are based on the actual area wet by the drip system. For example, a 5-ft bed generally becomes a 3-ft bed when covered with plastic mulch. Thus the rate used for this setup would be based on the total square foot area wetted, which is the area under the plastic, or 3-ft X total row distance. The square foot area is then divided by 43,560 sq ft to determine acreage to be treated. If on bare ground, run the system for several hours and measure the width of the wet zone on the bed, and calculate the square feet as above.

DuPont Crop Protection, Inc., has a 7-page brochure available, entitled *Drip Chemication: Best Management Practices*, that will help growers with their questions and decisions concerning drip irrigation and the injection of crop protection materials (www.Dupont.com). Also, each insecticide label that allows trickle/drip chemigation has a section on proper application of the insecticide via the drip system, including equipment requirements, mixing rates, etc. (www.CDMS.net, click on "services", then "labels" to download specific labels). Syngenta Crop Protection also has a 6-page brochure entitled "Best Use Guidelines for Drip Application of Crop Protection Products" which contains much information on chemigation management, equipment, rates, etc. Visit www.syngentacropprotection.com for more information.

Many University fact sheets are available on the internet that include information and instructions on how to inject agricultural chemicals into irrigation systems, including:

- University of Florida IFAS Extension publication #BUL250, *Injection of Chemicals Into Irrigation Systems: Rates, Volumes, and Injection Periods* (http://edis.ufl.edu/ae116)

-University of Florida Publication #HS980, *How to Conduct an On-Farm Dye Test and Use the Results to Improve Drip Irrigation Management in Vegetable Production* (http://edis.ifas.ufl.edu/HS222)

-Washington State University Fact Sheet FS035E, *Calculating Chemigation Injection Rates* (http://cru.cahe.wsu/CEPublications/FS035E/FS035E.pdf)

UPDATE ON FUNGICIDES FOR THE CONTROL OF IMPORTANT PEPPER DISEASES

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Anthracnose fruit rot has been an increasing problem in pepper production during the past few years in NJ. The pathogen, *Colletotrichum* spp., also causes a fruit rot in strawberries and tomatoes. The pathogen can infect pepper during all stages of fruit development resulting in serious losses if not controlled properly. Symptoms of anthracnose fruit rot include sunken (flat), circular lesions. In most cases, multiple lesions will develop on a single fruit. As lesions enlarge, diagnostic pinkish-orange spore masses develop in the center of lesions. During warm, wet weather spores are splashed onto healthy fruit through rainfall or overhead irrigation.

Managing anthracnose fruit rot begins with good cultural practices. The pathogen overwinters on infected plant debris and other susceptible hosts. The fungus does not survive for long periods without the presence of plant debris. Pepper fields should be thoroughly worked after the season to help break down and bury old debris. Heavily infested fields should be rotated out of peppers for at least three years. Do not plant or rotate with strawberries, tomatoes, eggplant or other *solanaceous* crops. Once areas in fields become infested, management of the disease can be difficult. Prevention is key to controlling anthracnose fruit rot. Some growers have had success by rouging out initial 'hot spots', either by removing plants within the 'hot spot' or by stripping all fruit from plants. Doing either will help reduce inoculum loads in the field and may help limit the spread of the disease. It's important that this be done at the very onset of the disease. Once pepper anthracnose is established, fungicides will have to be applied on a weekly basis. In order to protect the fruit, fungicides must reach the fruit, therefore coverage is critical for anthracnose control. A slower tractor speed and a higher volume of water will help in this manner.

Beginning at flowering, especially if fields have had a past history of anthracnose.

Alternate:

chlorothalonil at 1.5 pt/A or mancozeb at 1.6 to 2.1 lb/A

with a tank mix of chlorothalonil or mancozeb plus one of the following FRAC code 11 fungicides:

Cabrio (pyraclostrobin) at 8.0-12.0 oz 20EG/A, or
Quadris (azoxystrobin) at 6.0-15.0 fl oz 2.08F/A

Prevention is critical to controlling anthracnose fruit rot. Infected fruit left in the field during the production season will act as sources of inoculum for the remainder of the season, and therefore, should be removed accordingly.

Controlling Phytophthora crown and fruit rot.

Phytophthora blight (*Phytophthora capsici*) is one of the most destructive soil-borne diseases of pepper in the US. Without proper control measures, losses to Phytophthora blight can be extremely high. Heavy rains often lead to conditions which favor Phytophthora blight development in low, poorly drained areas of fields leading to the crown and stem rot phase of the disease. Infections often occur where water is slow to drain from the soil surface and/or where rainwater remains pooled for short periods of time after heavy rainfall.

For control of the crown rot phase of Phytophthora blight, apply:

Ridomil Gold (mefenoxam, 4) at 1.0 pt 4E/A or 1 Ultra Flourish (mefenoxam, 4) at 1.0 qt 2E/A, or MetaStar (metalaxyl, 4) at 4.0 to 8.0 pt/A. Apply broadcast prior to planting or in a 12- to 16-inch band over the row before or after transplanting. Make two additional post-planting directed applications at 30-day intervals.

For prevention of the fruit rot phase of Phytophthora blight, alternate the following on a 7 day schedule:

Ridomil Gold Copper (mefenoxam, 4) at 2.0 lb 65WP/A.

with one of the following materials.

Revus (mandipropamid, 40) at 8.0 fl oz 2.08SC/A plus fixed copper at labeled rate, or

Presidio (fluopicolide, 43) at 3.0 to 4.0 fl oz 4SC/A plus fixed copper at labeled rates, or

Forum (dimethomorph, 40) at 6.0 oz 4.18SC/A, plus fixed copper at labeled rate.

Tank mixing one of the above materials with a phosphite fungicide (FRAC code 33), such as K-Phite 7LP or Prophyt, will also help control the fruit rot phase of Phytophthora blight.

Skin separation or 'silvering' development in fruit of bell pepper.

In recent years, silvering or skin separation has become a serious fruit disorder in bell pepper production in New Jersey. As pepper fruit mature, the outer epidermis may develop 'silver' colored flecks. These flecks are thought to be caused by the separation of cells just beneath the epidermis. Although silvering does not affect fruit integrity, it reduces fruit quality making affected fruit unmarketable. Depending on commercial variety, silvering can be as high as 60% in some cultivars. Interestingly, the silvering of fruit has been associated to Phytophthora-tolerance in commercial cultivars. The more tolerant the pepper variety is to the crown rot phase of Phytophthora blight (*Phytophthora capsici*), the more likely it is to develop silvering in fruit. The bell pepper

cultivars ‘Paladin’ and ‘Aristotle’ are grown on much of the commercial acreage in New Jersey because of their tolerance to Phytophthora. Unfortunately, this makes a large percentage of bell pepper production acreage in the state susceptible to silvering. According to USDA grading standards, #1 bell peppers can have no more than 10% fruit with silvering.

Research in New Jersey has shown that the more resistant a bell pepper cultivar is to phytophthora infection, the more likely it is to develop symptoms of skin separation or ‘silvering’ in fruit. In research trials at RAREC and on-farm sites from 2006-2008, more fruit silvering was present in the phytophthora-resistant bell pepper cvs. ‘Aristotle’ and Paladin’ compared to the phytophthora-tolerant cv. ‘Revolution’ and phytopthora-susceptible cvs. ‘Alliance’ and ‘Camelot’ across all production systems.

PEPPER WEEVIL PATHWAYS

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Pepper weevil is one of the most severe pests of pepper production in the US. It is a southern insect that may become established in more northern fields by hitch-hiking its way north. Fortunately, it is only a sporadic pest in New Jersey. However, it has increased in the number of infestations in recent years.

Background

Pepper weevil (PW), Anthonomous eugenii, is a relative of the boll weevil. Like the boll weevil, PW is a southern insect that overwinters in the most southern parts of Florida, Texas and California. It is incapable of diapausing (a quiescent, non-feeding period of inactivity) but instead requires a year round supply of food, therefore it does not overwinter in New Jersey.

Most critically for New Jersey growers PW is not a migratory insect; however, it can be transported in pepper transplants, produce, or even by vehicular means. How it spreads to New Jersey is becoming an increasingly important question.

Once in a pepper field, PW females can lay 200 to 300 eggs individually in the rind of pepper fruit or blossoms. The female weevil can insert the egg under the plant cuticle, which can result in an egg scar, a dimple with a dark spot in the center. Once the egg hatches the weevil larva feeds on the interior tissue of the developing pepper, usually feeding in the area of the seeds. The larva is legless with a distinct head and initially is a cream white color turning grey-white as it matures. When mature the larva transforms into a non-feeding stage, the pupa, which normally is in a hollowed out cell in the pepper tissue. There the weevil matures to the adult stage.

Infested blossoms and small fruit are aborted by the plants and are one of the symptoms of an infestation. Larger fruit may not be aborted and the weevil will complete its development on the plant. Adult weevils exit the fruit either by chewing a hole through the pepper wall or escape through rotted areas of the aborted fruit. The whole life cycle can be completed in 2 ½ weeks to 3 ½ weeks, depending upon air temperatures. The warmer the temperatures the quicker the weevil develops.

Past and current infestations

Infestations of PW have occurred over the past 80 years in New Jersey, especially in the Hammonton area of southern New Jersey. Up until 2004, infestations would occur from one per year to once every five years. Since 2004, infestations have become

almost an annual event with some farms having repeated infestations. From 2004 to 2011, there have been at least 12 infestations with 7 of those on farms in the Hammonton area. Two more infestations probably resulted from transporting weevils from the Hammonton infestations.

Since 2004, it's estimated that NJ growers have lost about $200,000 dollars worth of produce and have spent thousands of dollars on insecticides used to control the weevil.

Pepper weevil management
Once a PW population has become established in the field it is very difficult to eliminate it. Therefore every effort should be taken to prevent infestations from occurring. NJ growers should avoid buying southern pepper transplants. Other pathways of transporting weevils may be through the shipping of infested pepper produce, or possibly in vehicles coming directly from southern farms.

Pheromone traps are useful in detecting adult weevils before there is any damage. These traps should be placed at the entry points of the field near the peppers. Trap kits (sticky cards and pheromone lures) can be purchased from Great Lakes IPM, http://www.greatlakesipm.com/ The cards with pheromones can be clipped to ¼ inch dowels and placed where desired.

The earlier an infestation can be detected, the better. Established populations of PW are very difficult to eliminate and costly. To date of the 12 infestations noted here insecticide control efforts on 11 of those have not eliminated PW but has slowed yield loss. Florida specialists recommend applications of Actara alternated with applications of Cryolite/Vydate/Pounce for the best control. Because of the difficulty in controlling this pest, the action threshold should be one weevil caught on a pheromone trap, or one infested fruit or blossom. Infestations occurring in early to mid-summer are more critical than those occurring in late summer.

In 2012, we will be attempting to determine when and by what means PW arrive on farms. We will be deploying a series of pheromone traps and inspecting loading docks or other places where out of state shipments are received. We will also be evaluating a new type of pheromone trap which also contains a feeding stimulant impregnated with malathion. Once we understand how the weevils are getting to New Jersey farms we will be able to devise the appropriate control tactics.

PLANT GROWTH AND THE ENVIRONMENT

SESSION

LIGHT AND TEMPERATURE EFFECTS ON PLANT GROWTH, SOIL NUTRIENT AVAILABILITY AND PEST CONTROL

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LIGHT - EFFECTS ON GROWTH:

Light is an essential input for growth of plants. Light is a major component of the photosynthesis process in which a plant utilizes carbon, oxygen and hydrogen to create energy (in simple terms). For field production purposes, farmers rely on the sun to provide light for plant growth. Season, weather conditions and site selection all attribute to sunlight availability for crop growth.

Light Quality – refers to the specific colors, or wavelengths, which make up light. Plants primarily respond to those colors in visible light: Red, Orange, Yellow, Green, Blue, Violet Light quality is important if artificial light is being supplied to a greenhouse crop during months with inadequate sunlight.

Light Duration – the length of time during a day that a plant receives light. This aspect is important for plants that exhibit photoperiodism. Photoperiodism refers to how flowering plants respond to the length of day and night. Many plants produce flowers based on the length of the day. Flowering plants fall into 3 photoperiod categories: long-day plants, short-day plants, or day neutral plants. Long-day plants flower in the late spring and early summer, when days are long (12 to 16 hours) and nights are short. Short-day plants flower in the late summer and early fall, when days are short (less than 14 hours) and nights are longer than eight hours. Day neutral plants do not respond to day length for flowering.

Long-day plants - Long-day plants require fewer number of hours of darkness in each 24-hour period to induce flowering. These plants typically flower in the northern hemisphere during late spring or early summer as days are getting longer. In the northern hemisphere, the longest day of the year is on or about 21 June (solstice). After that date, days grow shorter (i.e. nights grow longer) until 21 December (solstice). This situation is reversed in the southern hemisphere (i.e. longest day is 21 December and shortest day is 21 June). Some examples of long-day vegetables are pea, lettuce and turnip.

Short-day plants - Short-day plants flower when the night is longer than a critical length. They cannot flower under long days or if a pulse of artificial light is shone on the plant for several minutes during the middle of the night; they require a consolidated

period of darkness before floral development can begin. Natural nighttime light, such as moonlight or lightning, is not of sufficient brightness or duration to interrupt flowering. In general, short-day (i.e. long-night) plants flower as days grow shorter (and nights grow longer) after 21 June in the northern hemisphere, which is during summer or fall. The length of the dark period required to induce flowering differs among species and varieties of a species. Photoperiod affects flowering when the shoot is induced to produce floral buds instead of leaves and lateral buds. Note that some species must pass through a "juvenile" period during which they cannot be induced to flower. Examples of short day plants are chrysanthemum, rice, poinsettia, and morning glory.

Day-neutral plants - Day-neutral plants, such as cucumbers, roses and tomatoes, do not initiate flowering based on photoperiodism. These plants flower regardless of the night length. They may flower after reaching a certain stage of development or age, or in response to alternative environmental condition, such as vernalisation (a period of low temperature), rather than in response to photoperiod.

Other stresses may cause these plants to prematurely flower. Drought stress, lack of fertility, being root bound and other causes of stress can cause plants to prematurely flower. For instance, when you see tomato transplants in a root-bound condition with flowers or fruit, these plants have undergone stress induced flowering. The plant tries to produce progeny with seed to try to produce another generation before it dies. These plants have reached maturity that was induced by stress. Even if flowers and fruit are removed from these transplants and they are field planted, they will never achieve yield potentials that they would have if not undergoing stress conditions as transplants.

Light Intensity – the amount of light striking the plant. Light intensity is measured in foot candles. On a bright July afternoon, outside, there are 10,000 foot candles of light provided by the sun.

Symptoms of Inadequate Light Intensity: Under the worst of conditions, you'll see plants with stretched stems, plants that fail to flower, and unusual changes in leaf shape and size. This is most notable when plants are in a greenhouse and there are long periods of cloud cover. Under good but not ideal light the plant may show **Phototropism**, the growth or bending in the direction of the plant to reach a light source. The cells on the plant that are farthest from the light have chemicals called auxins that react when phototropism occurs. This causes the plant to have elongated cells on the farthest side from the light. **Etiolation** is the response of a plant to insufficient light. It is characterized by long, weak stems; smaller, sparser leaves due to longer internodes and a pale yellow color.

LIGHT - EFFECTS ON SOIL NUTRIENT AVAILABILITY

Light does not have much to do with soil fertility other than light can influence transpiration. Transpiration is the passage of water through a plant from the roots

through the vascular system to the atmosphere. When light is plentiful, soil moisture is within acceptable levels and winds are not present or not strong, transpiration can occur at an optimum rate. However, under windy, hot, high sunlight conditions transpiration is accelerated. If there is enough soil moisture, plants will take up water and nutrients being driven by transpiration. However, if soils are droughty, plants will wilt since water loss exceeds water uptake. Getting back to light, when cloudy conditions occur, transpiration can be reduced. If transpiration rates are hindered, nutrient uptake may be hindered and if severe this can cause nutrient deficiencies that cause physiological problems in plants. For example, blossom end rot of tomato caused by Calcium deficiency.

LIGHT - EFFECTS ON PEST CONTROL

A few aspects of pest control that may be affected by light include pest activity and phytotoxicity of certain chemicals. Many insect pests are active during certain times of the day or night. Many moth (Lepidoptera) pests are active flying and laying eggs at night. Many beetles are active during the day. Therefore, it may be important to know when a pest is most active to attain optimum levels of control.

Phytotoxicity is the degree to which a chemical or other compound is toxic to plants. With light relationships to phytotoxicity it is usually termed **Episodic Phototoxicity. T**his refers to an episode where a common spray, for some unknown reason, and where it has never occurred before, suddenly causes plant injury. Usually in this type of situation weather conditions are a factor. Some sprays are safe in cooler weather whereas they can become very dangerous in high heat conditions. Also, a plant may have been growing under low light conditions for an extended period of time and the epidermal layer on the leaf was thin with very little cuticle layer (waxy coating on leaves) and a pesticide was applied at the same time high light conditions and high temperatures began. This could cause episodic phytotoxicity. If phytotoxicity of a certain chemical is known, it will often be listed on the pesticide label.

Phytotoxic effects can range from slight burning or browning of leaves to death of the plant. Sometimes the damage appears as distorted leaves, fruit, flowers or stems. Phytotoxicity is not necessarily caused by the active ingredient. Plant damage can also be caused by: the solvents in a formulation, impurities in spray water, using more pesticide than listed on the label, or poorly mixing the spray solutions. Condition of the plant at the time of treatment can affect phytotoxicity; stressed plants may be more susceptible. Environmental conditions such the temperature, humidity, and light can influence phytotoxicity. High temperatures can speed up pesticide degradation and volatilization, but may also result in increased phytotoxicity for some products. UV light rapidly breaks down many pesticides and therefore at times, may be detrimental to the efficacy of that pesticide to get optimum control.

TEMPERATURE – EFFECTS ON GROWTH

Soil temperature affects seed germination, root growth, microbial activity and nutrient availability and uptake. Cold soils slow the establishment of young plants, reduce plant rooting depth, restrict the decomposition of organic matter and the release of available nutrients, and limit the uptake of plant nutrients (especially phosphorus).

TEMPERATURE – EFFECTS ON SOIL NUTRIENT AVAILABILITY

Soil nutrients - Soil supplies 13 essential plant nutrients. Each mineral nutrient plays one or more specific roles in plants. Nitrogen, for example, is a component of chlorophyll, amino acids, proteins, DNA and many plant hormones. It plays a vital role in nearly all aspects of plant growth and development, and plants need a large amount of nitrogen to grow well. In contrast, plants only need a tiny amount of molybdenum, which is involved in the functioning of only a few plant enzymes. Molybdenum nonetheless is essential, and plant growth is disrupted if it is deficient. Plants also require carbon, hydrogen and oxygen, which they derive from water and air.

A soil nutrient is classified as a *primary nutrient, secondary nutrient,* or *micronutrient,* based on the amount needed by plants.

Essential plant nutrients

Primary nutrients
- Nitrogen - N
- Phosphorus - P
- Potassium - K

Secondary nutrients
- Sulfur - S
- Calcium - Ca
- Magnesium - Mg

Micronutrients
- Zinc - Zn
- Iron - Fe
- Copper - Cu
- Manganese - Mn
- Boron - B
- Molybdenum - Mo
- Chlorine – Cl

Nutrient availability to plants

Plants mainly take up nutrients that are in *solution* (dissolved in soil water). Most soil nutrients are not in solution; they are tied up in soil minerals and organic matter in insoluble forms. These nutrients become available to plants after they are converted to soluble forms and dissolve into the soil solution. Cold soil temperatures can slow

nutrient conversion, release, availability and uptake capability of roots.
Weathering of mineral matter and biological decomposition of organic matter will provide nutrients. Weathering of mineral matter is a very slow process that releases small amounts of nutrients each year. The rate of nutrient release from soil organic matter is somewhat faster and depends on the amount of biological activity in the soil. Many times the removal of nutrients by a crop exceeds the soil's supply and additional fertilizers must be applied to meet crop demands.

Nutrient uptake by plants is fastest in warm, moist soils. Plants need the largest amount of nutrients when they are growing most rapidly. Rapid growth occurs at different times of the year for different crops. In early summer for potatoes grow fastest and growth is fastest in early spring for lettuce and other greens.

TEMPERATURE – EFFECTS ON PEST CONTROL

Just like with light, temperature can affect pest activity and timing. The activity of certain insect pests, development of fungal and bacterial diseases and germination for certain weed pests can be influenced by temperature.

SOIL WATER, SOIL pH AND SOIL ORGANIC MATTER EFFECTS ON PLANT GROWTH, NUTRIENT UPTAKE, SOIL NUTRIENT RETENTION AND PLANT DISEASES

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There are many reasons that plants can or cannot absorb nutrients contained in the soil they are growing in and the process can be complicated. Creating a healthy soil environment is the most effective way to maximize nutrient availability and uptake for plants.

SOIL WATER

Soil water plays a major role in plant health and plant growth. It is the carrier of many nutrients in the soil into the roots. Water transports nutrients within the plant, cools the plant, provides turgidity (stiffness) in the plant and is the key source of hydrogen the plant used for metabolic processes. Water plays a role in plants, much like it does in our own bodies.

If your soil stays wet in the spring, you will have to delay tilling and planting. Working wet soil can damage its structure. Seeds are less likely to germinate and often rot in cold, wet soil.
Many plants don't grow well in wet soil. Raspberries, for example, often become infected by root diseases in wet soil and lose vigor and productivity.

Soil Pore Space:

A productive soil is both permeable to water and able to supply water to plants. A soil's permeability and water-holding capacity depend on its network of pores:

Large pores (*macropores*) control a soil's permeability and aeration. Macropores include insect, earthworm and root channels. Because they are large, water moves through them rapidly by gravity. Rainfall and irrigation infiltrate into the soil and excess water drains through it.

Small pores *(micropores)* are fine soil pores, typically a fraction of a millimeter in diameter. They are responsible for a soil's water-holding capacity. Like the fine pores in a sponge or towel, micropores hold water against the force of gravity. Much of the water held in micropores is available to plants, while some is held so tightly that plant roots cannot use it.

Soil that has a balance of macropores and micropores provides adequate permeability and water-holding capacity for good plant growth. Soils that contain mostly macropores drain readily but are droughty and need more frequent irrigation. Soils that contain mostly micropores have good water-holding capacity but take longer to dry out and warm up in the spring. Runoff of rainfall and irrigation water also is more likely on these soils. The total amount of pore spaces in the soil is its *porosity*.

Particle size also affects the surface area in a volume of soil. Surface area is important because surfaces are the most chemically and biologically active part of the soil. They hold plant nutrients, provide a home for microorganisms and bind contaminants. Clay particles have a very large surface area relative to their volume, so a small amount of clay makes a large contribution to a soil's total surface area.

Drought:

When drought conditions occur in soils, plants can wilt. Wilt can cause significant problems with plant growth and future yields. When a plant is stressed from lack of water, plant functions may slow or cease. One of the first plant responses to lack of water is closing of the stomates (openings on the undersides of leaves that regulate respiration and water loss through leaves). When stomates close this disrupts the movement of water and nutrients through plants, since transpiration (movement of water and nutrients) is regulated by root uptake and stomatal removal. Think of it as a pump. The roots are the intake and the stomates are the hydrant or output. If the stomates close, like a closed valve on a pipe, then no water movement can go through that pipe. Hence, nutrients and energy are not transported throughout the plant. When severe lack of water occurs in plants, wilt can be seen. Additionally, with prolonged drought stress plants will abort certain parts to try to lessen the burden of having too many leaves or other plant parts, especially fruit and flowers. This is why we often see dropping of leaves or abortion of flowers in fruiting crops.

Excessive Soil Water:

When soils have too much water, they may drain or may stay water logged for periods of time, depending on soil type, structure and slope. Excessive rainfall or irrigation leaches certain nutrients in soil and therefore they are not there for plant needs. Optimum soil moisture levels will assist with availability of nutrients that are taken up in the soil solution by roots. Roots also need air space in the soil pores to survive. Just like other parts of the plant, roots respire. If kept in water logged soils they will suffocate and in instances where soil-borne diseases are present weakened roots are susceptible to disease infection.

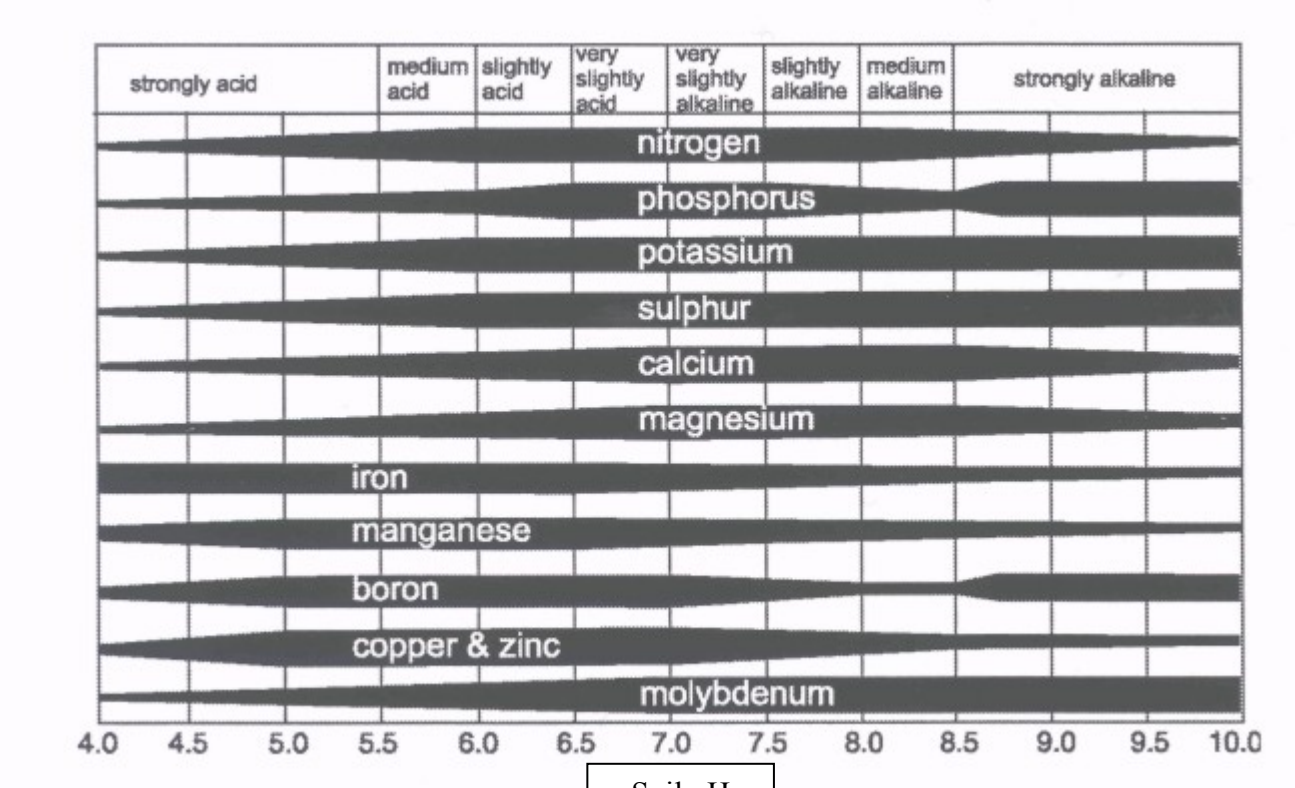
SOIL PH

Soil pH measures the acidity or alkalinity of a soil. At a pH of 7 (neutral), acidity and alkalinity are balanced. Technically, pH is a gauge of the hydrogen-ion concentration in

the soil. Soils become acid when basic elements, such as calcium, magnesium, sodium, and potassium held by soil colloids are replaced by hydrogen ions.

Most plants prefer a somewhat neutral pH, anything from 6.2 to 7.0. However there are many plants that are more specific in their pH needs, such as blueberries which like a very acidic soil and lilacs that prefer a more alkaline soil.

Soil pH can hinder or assist in the release of some soil nutrients. A chart below shows the availability of essential plant nutrients under certain pH levels. The wider the bar the more available that nutrient is to plants. The thinner the bar, the less available that nutrient is for plant uptake.



SOIL ORGANIC MATTER

Many soils need organic matter added to increase organic matter levels. Green manures are cover crops grown specifically to be tilled or dug into the soil. Planting green manure crops is a way to grow your own organic matter. The value of cover crops goes beyond their contribution of organic matter, however. They also can do the following:

- Capture and recycle nutrients that otherwise would be lost by leaching.
- Protect the soil surface from rainfall impact.
- Reduce runoff and erosion.

- Suppress weeds.
- Supply nitrogen (legumes only).

Soil organic matter also creates macropore spaces in soil that helps with soil aeration and drainage. Organic matter is also a good food source for beneficial microorganism and earthworms. Beneficial microorganisms can assist in making nutrients available, compete with pathogens in soil and improve the soil environment.

Besides cover crops other forms of organic matter can be added for soil health improvement. Municipal leaves, manures, and other organic amendments have all proven to be beneficial to soil health.

EFFECTS OF SOIL AND WATER CONDITIONS ON HERBICIDE ACTIVITY AND WEED CONTROL

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Soil can have a strong influence on weed growth and residual herbicide effectiveness. The soil characteristics that influence herbicide effectiveness include texture, percent organic matter and pH. Have soil texture determined by mechanical analysis. Most soil maps that soil list texture were drawn quickly using the "feel" method and may be inaccurate. A mechanical analysis of your soil will determine the amounts of sand, silt and clay in the mineral portion of the soil. Sand particles are the largest, silt is medium in size, and clay particles are the smallest. Soils with a large percentage of large sand particles are considered to be coarse in texture and are called a sand, loamy sand, or sandy loam. Soils with a moderate amount of each size soil particle are considered to be medium in texture, and are called loam, or silt loam. Soils with a large percentage of small clay particles are considered to be fine in texture and are called silty clay loam, clay loam, or clay.

Soil particles are negatively (-) charged. The negative charge of soil particles attracts positively (+) charged fertilizer molecules such as $H_2PO_4^+$, K^+, Ca^{++}, Mg^{++} and others. The attraction of the positive charge to the negative charge of the soil particles slows leaching. Since substances that are positively (+) charged are called cations, the measure of a soils ability to hold onto cations is called the **Cation Exchange Capacity** or **CEC**. Sand is the largest particle in size and has the lowest **CEC** value, less than one. Silt is intermediate in size and has an intermediate **CEC** value, near five. Clays are the smallest soil particles and have the highest **CEC** value of the mineral component of soil, near thirty-five, depending on the type of clay.

Many herbicides have a positive (+) charge or are polar, which means they are positively (+) charged at one end and negatively (-) charged at the other end. These herbicides can be held onto by the soil to varying degrees. When held by soil , individual molecules of these herbicides are not available to the weeds or the crop. The higher the **Cation Exchange Capacity** or **CEC** of a soil, the more herbicide is held. Increased herbicide rates are needed to control weeds in soils with a high **CEC**. The lower the **Cation Exchange Capacity** or **CEC** of a soil, the less herbicide is held. Decreases in the herbicide rates are needed to prevent crop damage in soils with a low **CEC**. Plant nutrients, such as NO_3^-, and herbicides with a negative (-) charge are not held by the soil, leach more rapidly, and are less affected by soil texture than those with a positive (+) charge.

Organic matter makes up only a small part of most soils, usually between 0.5 and 5.0 percent in soils across the northeastern United States, but it has the highest **CEC** value, near two hundred. Even small changes in the percent organic matter in soils, especially sandy soils, can have a strong influence on herbicide performance. That is the reason small changes in percent organic matter may require herbicide rate changes. Rate tables may have several columns with different herbicide rates for different levels of organic matter in each soil type.

Soil pH also affects the performance of some herbicides by influencing the degree of attraction to soil particles. Recommended soil pH levels for many crops range between 6.0 and 7.0. Low pH, below 6.0, or high pH, above 7.0 may affect the availability of certain herbicides. Weed control may be reduced and/or herbicide carryover may be increased if the herbicide is more tightly bound to the soil than at "recommended" pH levels. The risk of crop injury may increase if a herbicide is less tightly bound to the soil than at "recommended" pH levels. This may result in different rate recommendations or **DO NOT USE** warnings on some herbicide labels if the soil pH is above or below a certain value.

FARM SAFETY

SESSION

FARM SAFETY PRIORITIES FOR AGRITOURISM SITES

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It is estimated that over 100 children are fatally injured by farm accidents each year in the United States. Young children are most commonly injured on the farm as bystanders. With the rise in interest of on-farm activities for families, schools and other organizations farmers need to pay particular attention to hazards that could affect non-farm residents. Visitors are not familiar with farm hazards, and are at times oblivious to farm hazards that might seem obvious to the farm owner.

Pre-Visit Considerations

Educational materials should be made available to those who plan to visit the farm. Packets of information can be mailed to schools and other large groups who will be visiting. General materials can be made available online so that they are easily accessible for casual visitors to the farm. Below are some suggestions of educational materials that may help reduce safety concerns on your farm.

- Detailed health and safety information about the farm
- Child to adult ratio suggestions
- Proper attire suggestions
- Items to bring to the farm
- What not to bring to the farm
- Personal contact information forms for children visiting without a parent
- Farm Emergency Response Plan

Familiarize visitors with your farm

Familiarity with the farm will make a farm visitors time more enjoyable, and safe.

- Farm map
- Hazard identification and explanation
- Posted rules
- Explanation as to why these rules will help keep them safe
- Signage at each hazard area with a safety message
- “In Case of Emergency” information and exact location of the farm
- Inform guests of the bathroom locations and proper hand washing locations and methods

Potential on-farm hazards for agritourism sites

Use the following list as a starting to point to identify potential on farm hazards. Each farm is unique and will have hazards that are specific to that farm and its operations.

- Farm traffic areas
- Walking surfaces

- Barriers to hazard areas such as
    - Irrigation ponds, lagoons, and other water sources
    - Workshops and repair facilities
    - Pest management materials
- Storage facilities
    - Pesticide storage facilities
    - Machinery
- Farm equipment
- Ladders
- Farm animals and pets
- Ponds and other water hazards
- Fire hazards
- Electrical
- Inclement weather
- Hayride safety
- Corn maze safety

WHAT ARE THE REAL FARM SAFETY HAZARDS ON OUR FARMS?

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The advent of modern pest control technology really came into vogue after World War II; however the start of this technology goes much farther back into the 19th century. Man has always had challenges dealing with producing food and protecting it from the ravages of insects, diseases, weeds and many other perils that affect our food supply. In the 1850's David Pettit, a farmer from Salem County, New Jersey made the statement "….." What he was describing was late blight of potato, a disease that changed the course of history and resulted in worldwide immigration from Ireland and other countries. Early farm publications were touting educational meetings "as good as money!" as early as 1900, despite not understanding the basis for many agriculture pest problems. Early pest control focused on application technology that utilized dusts that were applied at heavy rates and resulted in considerable off site deposition of the materials. Today's technology of course focuses on spray applications that are more controllable and effective in dealing with and controlling various pests. Hazards of pest control in those days were both real and abundant in Agriculture.

After World War II, great advances were made in developing newer, more effective spray materials. Safety standards for pesticide usage came in later years as various problems arose and training of applicators was instituted at both a state and national level. One situation that can cause contamination problems is when pesticide storage is near food eating areas. Workers should be made aware that even pesticide vapors can cause problems and that frequent hand washing is critical in order to protect their own health as well as preventing unwanted residues. Sometimes cross contamination not only occurs with human hands and food but also can occur between various other pesticides. Volatile pesticides such as 2,4 D can impregnate other materials and cause problems because even small amounts of residue can damage highly sensitive plants. Spill isolation of pesticides is another area of concern. If storage is large in size and contains many gallons of liquid pesticides, some type of containment system should be incorporated into the storage design. On the other hand, if only a few gallons on small containers are involved a simple aluminum pan and some kitty litter might be all that is needed to stabilize a small, less than1 gallon leak or spill.

Choosing the right respirator is something that should be given consideration in order to give you, the applicator, adequate protection. It is easy to assume that a respirator is a respirator and they are all about the same. This however is not true. Be sure you are buying a respirator that is designed and designated for volatile vapors/pesticides. I sometimes see farmers wearing simple dust masks as protection but these are woefully

inadequate for the intended task. A pesticide respirator cartridge does list a use by date much like perishable foods. You should use the mask within the certified dates to get the maximum protection out of them. A pesticide respirator is only as good as its fit. We all have different shaped faces, heads etc so therefore it is important to test the fit of your respirator to see that it works properly. Place the mask over your face and breathe out slowly. If there is air rushing between your mask and face, the seal is not good and must be adjusted to for your face. Safety supply companies sell a substance called “banana oil” which is a material that you can smell even at low levels. By following the edge of your respirator with the oil capsule as you breathe in and out you will be alerted by smell to even a very small problem with the fit of your mask.

Modern agriculture uses many pieces of equipment that are powered by relatively high amounts of horse power. The most common method to power other pieces of farm equipment is of course the PTO unit. PTO units actually convert power (movement) into torque (spinning motion) to make things work. The problem is that there is no human being no matter how strong they are that is a match for the power released from these types of mechanisms. PTO accidents can occur within a 1/10 of a second, so before you know what is happening to you the accident / entanglement has occurred. Actually one of the best case scenarios from a PTO accident is to have all of your clothing ripped off your body. Embarrassment is not pleasant however it is much better than death or permanent, lifelong injuries. Studies have shown us that PTO accidents occur for a lot of reasons but that three reasons are most often to blame. First, farmers work long hard, hours and as a result fatigue is on of the prime causes of accidents. Second, because there are so many things to do on the farm being in a hurry is another prime cause of farm accidents. Third, the new Jersey farm population is getting older which slows the reaction time. Some farmers have a fatalistic attitude and more or less accept accidents as “the price of doing business”. I feel that this is a very misguided attitude and there are many things we can do to at least lower the number of accidents. Here are some of my suggestions:

1) Always shutoff the tractor and equipment when dismounting to explore a problem
2) Be sure all decals and shields are in their proper place. Just because you have done something a million times does not mean it is safe!
3) No loose fitting clothing or hair. Secure if necessary.
4) Make sure shoe laces are tied. Taught to kids but still a problem with PTO entanglements
5) Walk around equipment and DO NOT step over PTO shaft whether engaged or not!
6) No extra riders or bystanders on tractors when you are working with equipment.

Equipment on farms seems to be an obvious source of danger on our farms. But there are many other less obvious hazards we can over look. For example, a hazard from water on farms is the second leading cause of death on Pennsylvania farms. A full 18% of farm deaths are from drowning. I have even been involved in a farm pond drowning

incident where horses were involved which caused the farmer unneeded problems. A tractor roll over is still another potential problem on farms even in New Jersey where we are flat. In demonstrations I have done, a simple 3" log is all that is needed to roll a tractor where there is a short front wheel base. We have many of these type tractors still in use today on fruit and vegetable farms here in New Jersey. A pile of grain or fertilizer may seem picturesque however they can de deadly if you are sucked into a vortex that can occur when these materials are augered from the bottom of the piles.

Hazards on farms do not always have to be equipment related. With today's emphasis on food safety geese and other wildlife can are considered a hazard. E coli contamination in recent times has caused considerable economic loss as well as deadly health issues. Food safety audits are becoming the norm and are sure to accelerate in the next few years. Something as simple as poison ivy, a plant on all our farms, can be a potential hazard. I personally know two farmers who were sued when customers came in contact with poison ivy on their farms. The farmers lost the suits even though the PYO customers wandered into parts of the farm they were not supposed to be. Forklifts are still another accident prone area on farms. Lifting heavy loads of produce, cranberries, or any other commodities high in the air can cause significant changes in the pivotal balance point where the tractor can flip from front to back as was the case with one cranberry grower.

Farm accidents occur and unfortunately are a fact of life in agriculture which results in giving agriculture the distinction of being one of the most dangerous occupations along with fishing and mining. After a farm accident, every thing changes except for the desire of the farmer to continue farming. Many surveys have shown this outcome. Last year I negotiated a grant to have New Jersey farmers participate in a program called AgrAbility. To put it simply, AgrAbility's goal is to keep farmers with disabilities farming. Between 15-25% of all farmers have some type of disability that prevents them from performing their farming duties as efficiently as possible. One example is a cranberry grower I work with who is older and has a hard time getting around the farm. On the other hand he is still is the most knowledgeable person on the farm when it come to the equipment, how it is used, and to how to fix it. What we will do is obtain a piece of equipment called a Ventrac which will enable him to freely move around the farm on his own accord. He can try it for a while and then can decide if he wants to buy one of his own. A few years back we were able to get a paralyzed farmer a chair lift that he could get on and off his tractor by himself and maintain some independence. The possibilities are endless on what this program can do to keep farmers farming. AgrAbility deals with all type of disabilities even those which some farmers feel are minor such as hearing loss, back problems etc. I would encourage any farmer who would like to hear more about the program to give me a call at (609) 265-5050 and I will to my best to make the program work for you.

Farm accidents are unfortunately all too common. The list I am showing you are all farmers in our New Jersey Ag community that have died from farm accidents. I know all

of them and I will bet that there is no one in this room who does not know at least one of them. The sad situation is that this slide is usually out of date because these accidents occur frequently. Let us all work to loose our distinction of being the most dangerous occupation in the world!

BROWN MARMORATED STINK BUG

SESSION

A REVIEW OF ADULT BROWN MARMORATED STINK BUG (BMSB) POPULATIONS FROM THE RCE IPM BLACKLIGHT NETWORK

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In 2011, the Rutgers Cooperative Extension (RCE) Vegetable Integrated Pest Management (IPM) Program personnel added the brown marmorated stink bug (BMSB) to its' list of insect pest species for which weekly population maps are produced. Insect pest species that are mapped also include corn earworm, European corn borer, and beet armyworm.

BMSB adult numbers in New Jersey had been increasing since first detection in 1999, with a dramatic rise in adult catches in 2010. That adult population increase was accompanied by significant injury to tree fruits throughout the state as well as to peppers and sweet corn in northern and central counties. In 2011, statewide weekly average catches increased nearly 98% over the previous year, and 52 times higher than in 2009. Whilethis increase continued the trend of larger adult catches, there were differences between 2001 and 2010. The first notable change between years was the shift in adult population from northwestern NJ to southern counties (see figure 1).

The peak catches for the state occurred during the week ending July 27, 2011. During that week, catches in the Shirley (Salem County) blacklight were over 280 adults per night. Several other light traps in the southern counties recorded catches well over 50 adults per night at that time. This peak occurred approximately one week later than the 2010 peak.

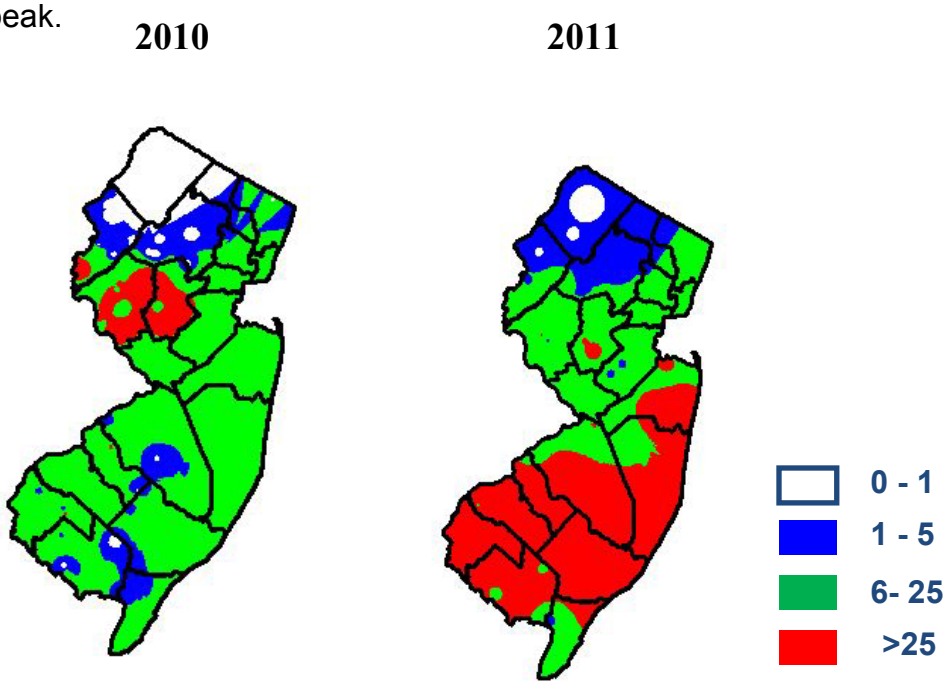

Figure 1. Average weekly adult BMSB catch in blacklight

With growers in Warren County experiencing BMSB injury on up to 75% of fruit in certain pepper types in August of 2010, it anticipated that extreme injury would occur in parts of the state where adult activity was highest from late July through mid August. In fact, growers remarked that there was little stink bug injury to crops like sweet corn and peppers through August and September of 2011. At the Snyder Research and Extension Farm in Pittstown, Hunterdon County, no BMSB injury occurred on a bell pepper plot established specifically to evaluate a kaolin-based spray product as a feeding deterrent. This lack of injury was despite adult catches over 50 per night during the first week of August at Snyder Farm.

Seasonal differences and changes in host availability may influence the degree to which BMSB causes injury on cultivated crops, although it is unclear at this point how this works. Our native brown stinkbugs (*Euschistus* species) are capable of causing significant injury on tomatoes. However, like many stinkbugs, *Euschistus* species have a number of hosts, both wild and cultivated. IPM program personnel have observed tomato injury from *Euschistus* to be much higher in dry years. We speculate that this is because wild hosts in nearby hedgerows become too dry to adequately supportstinkbug development. This drives adults into irrigated row crops to feed, mate and lay eggs. 2010 was a much drier year than 2011, particularly during the months of August and September when BMSB would likely be most damaging to cultivated vegetable crops. This may have increased or preserved the quality of wild hosts of BMSB, making them less inclined to move into crops like peppers. Some researchers have commented that extreme rain events may have reduced late summer BMSB numbers or hindered movement, thereby reducing crop injury. Continued investigation into events or combinations of events that impact pest status of BMSB is absolutely necessary so that we may begin to predict the likelihood of damage and react accordingly. Without this ability, growers must resort to use (and possibly overuse) of broad spectrum insecticides to manage BMSB.

INSECTICIDE EFFICACY RESEARCH ON BROWN MARMORATED STINK BUG ON VEGETABLES IN VIRGINIA

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The invasive brown marmorated stink bug(BMSB) has become a damaging pest of vegetable crops in the mid-Atlantic U.S. Based on farm surveys in 2011, the most preferred vegetable plants include sweet corn, okra, green and lima bean, pepper, eggplant, and tomato. The bugs typically infest the vegetableplants during pod or fruiting stages. Both nymphs and adults insert their piercing mouthparts into fruiting stages, stems or leaves, which can result in scarring, necrosis, fruit abortion, or fruit rot if pathogens enter the feeding site. Under heavy BMSB pest pressure, significant crop loss can occur to the aforementioned vegetables.

At Virginia Tech in 2011, selected insecticides were evaluated using green bean dip bioassays on brown marmorated stink bug nymphs and adults, as well as field efficacy trials on bell peppers. For the green bean dip bioassays, insecticide solutions were mixed based on the highest labeled rate and 100 gal /acre output. Green bean (*Phaseolus vulgaris*) pods were: dipped in solution for 5 sec, allowed to dry for ≈½ hr under a fume hood, then placed in a 9-cm Petri dish with filter paper and either 5 stink bug adults or 5 nymphs (2^{nd}-3^{rd} instars) per dish. There were 4 Petri dishes per treatment for a total of 20 insects tested each bout. Bioassays were repeated Mortality (dead + intoxicated bugs) was assessed after 72 hr. For the field efficacy trials, 'Aristotle' bell peppers were established on black plastic mulch at the Virginia Tech Kentland Research near Blacksburg, VA. Small plot experiments were arranged in a randomized complete block with 4 reps. At fruiting stage, four weekly spray applications were made using a backpack sprayer, and % stink bug injury to pepper fruit was assessed on three post-spray harvest dates (in Aug). Percentage control was calculated as a reduction in stink bug damage averaged over the three harvest dates.

Table 1 ranks the insecticides based on their average performance across the nymph green bean dip bioassays, the adult green bean dip assays, and the pepper field experiments. Results indicate that a wide range of insecticide products can provide high levels of brown marmoratedstink bug control. Additional research on the residual efficacy of these insecticides needs to be conducted. As is always the case when applying pesticides, please read the label carefully to ensure that the product is labeled for the specific target and crop.

Table 1. Performance of insecticides against brown marmorated stink bug in Virginia (data from T. Kuhar, Virginia Tech, 2011).

Product	**Rate oz/Acre**	% mortality from bean dip bioassay* **Nymph**	**Adult**	% control in the field: peppers**	Avg. % control from all three experiments
Permethrin 3.2EC	8	97.5	98.8	60.6	85.6
Scorpion 3.24	7.7	76.7	90.0	85.4	84.0
Bifenture 10DF	12.8	100.0	81.9	56.3	79.4
Trebon	8	100.0	100.0	36.5	78.8
Baythroid XL	2.8	92.5	88.2	52.8	77.8
Venom 70	4	100.0	80.0	46.0	75.3
Endigo ZC	4.5	75.0	98.7	49.2	74.3
Acephate 97UP	16	100.0	51.8	70.4	74.1
Lannate LV	40	66.7	75.3	79.8	73.9
Leverage 360	2.8[a]	97.3	74.5	49.9	73.9
Brigadier	9.85	76.7	70.0	69.9	72.2
Hero EC	10.3	91.7	50.0	72.8	71.5
Vydate L	48	85.0	47.0	79.7	70.6
Warrior II	2.5	100.0	72.8	38.0	70.3
Belay	4	75.0	67.5	66.7	69.7
Actara 50 WG	5.5	66.7	81.0	60.3	69.3
MustangMax	4	100.0	35.0	72.8	69.3
Danitol	16	93.3	42.5	60.3	65.4
Assail 30 G	4	90.0	32.8	70.4	64.4
Lambda-cy	3.84	86.0	32.3	62.0	60.1
Asana XL	9	35.0	27.5	76.4	46.3

* Mortality refers to the percentage of dead + moribund individuals after 72 hrs.
** Based on reduction in stink bug injury to pepper fruit from three harvests.
[a] Not the highest labeled rate for all vegetables.

BROWN MARMORATED STINK BUG RESULTS OF PEPPER TRIALS 2011

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The brown marmorated stink bug (BMSB) attacks many vegetable crops, including tomatoes, beans, corn, peppers, and cucurbits. It is a serious economic pest because it attacks the fruit directly, often leaving it misshapen or marked with feeding spots. In peppers, these spots may show up as bright white or yellow blotches, and can cover the entire fruit in bright blotches. Bell pepper trials were conducted in the laboratory and in the field at the Rutgers Agricultural Research and Extension Center during 2011 to test numerous materials for efficacy against this pest.

Laboratory and field trials examined 10 different insecticides, 5 of which belonged to the pyrethroid class of insecticides, and 5 non-pyrethroids. Peppers were monitored every 3-4 days in the field, and sprays were initiated when at least 1 adult BMSB/5 plants was recorded. All treatments were applied on every 6 days for a total of 7 applications. Treatments included full labeled rates of Asana XL, Baythroid XL, Danitol EC, Leverage 4.1, Warrior II, Actara WDG, Assail 30SG, Belay SC, Lannate L, Orthene 97 and an untreated.

Immediately after the initial spray applied on 15 July, two peppers from each plot were picked and placed in large plastic containers in the laboratory. A total of 3 BMSB from a laboratory colony were placed in each box with the treated pepper, with a total of 2 replications of all treatments. The BMSB mortality was recorded over the next 5 days to determine effectiveness of the field spray application. With the field trials, peppers were harvested three times during the trial, on 18 July, and on 3 and 18 August. All harvested fruit were examined for stink bug damage, and the numbers of stings on each fruit were counted and recorded.

A row of bell peppers (‘Paladin’ cv) and tomatoes (‘Celebrity’ cv), side by side, were left untreated, and all fruit were harvested and examined for stink bug damage to determine if these pests had a preference for one or the other.

A final laboratory bioassay examined a potential stink bug repellent. The repellent was a chemical produced by a fungus obtained from within common foxtail plants (*Setaria viridis* [L] Beauv.), and is known to effectively repel the white-spotted stink bug (*Eysarcoris ventralis* Westwood) in Asia. Treated and untreated pepper fruit were placed in containers with 5 adult BMSB per container, and damage to the fruit was recorded over time to determine treatment effects.

Field Bioassay Trials

After the initial spray in the field, pepper fruit were picked and placed in containers with BMSB in the laboratory. All treatments resulted in greater than 67% control of the bugs, and most treatments resulted in greater than 80% control, at the end of the 5 day laboratory bioassay. The highest efficacy was observed with Baythroid, Leverage and Orthene. These results, like the field trials, show that a wide range of insecticides are effective in reducing damage caused by stink bugs.

Field Efficacy Trials

In the field efficacy trials, all five pyrethroid and all 5 non-pyrethroid insecticide treatments resulted in significantly less stink bug damage to the peppers as compared with the untreated on all three harvest dates when applied at the labeled rate. Results indicate that many labeled products, belonging to different classes of insecticides, are effective in reducing damage to pepper fruit caused by stink bugs.

BMSB Feeding Preference Trial

Both tomato and pepper fruit were equally attacked by stink bugs in the field. 'Celebrity' tomato had 72.6% of the fruit damaged, and 'Paladin' pepper had 71.1% of the fruit damaged when fruit were left in the field and harvested one time on 11 August. Both tomato and pepper had about 7 stink bug stings per fruit at harvest. This trial suggests that the longer the fruit are in the field, the greater the risk of stink bug damage.

Stink Bug Repellent Trials

Although the trial was limited, pepper fruit that had been treated with a repellent and peppers that had no treatment showed stink bug damage when placed in containers with adult BMSB from a laboratory-reared colony. Field studies need to be continued.

SWEET CORN

SESSION

DELIVERING INNOVATION IN THE SEED: A REVOLUTION IN VEGETABLE PLANT BREEDING

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At Monsanto, we are committed to supporting farmers in their efforts to produce more, conserve more, and improve the quality of life. Agriculture must meet the needs of everyone for food, fuel, and fiber, and it must do so while protecting the natural resources required tosustain it. In 2008, Monsanto issued a three-fold commitment called the Sustainable Yield Initiative. But wewon't achieve the goals of the Initiative alone. Keys to our commitment to meet the global challenges facing agriculture in the coming decades are to forge new partnerships and promote a spirit of collaboration across the entire agricultural supply chain, including our vegetables business. World population is expected to reach 9.3 billion people by 2050, and the demand for a wider variety of high-quality vegetables will continue to increase. Monsanto is making significant investments in people, facilities, and technologies to ensure our farmer customers are able to satisfy the markets for abundant, nutritious vegetables. We currently have more than 50 breeding and testing stations in 19 countries, with dozens of plant breeders distributed around the world.

One of the key technology tools used by our breeders to improve the efficiency of selecting important traits is molecular markers. Markers can be thought of as landmarks within a plant's genome that enable breeders to follow native genes and understand their function. Using markers, breeders can be certain of selecting and advancing plants that contain the most desirable characteristics. There are several examples of products in Monsanto Vegetables' pipeline that have been selected and are being developed for commercialization using molecular markers, including downy mildew-resistant cucumbers and Phytophthora-resistant peppers.

Although molecular markers are based on DNA sequences and can be considered as products of modern biotechnology, thesequences already exist within a plant's genome and are used to track native, inherent genes (not transgenes). Therefore, the products resulting from their use are "conventional", and not "biotech" in the typical sense. Monsanto's approach to vegetable improvement is in fact predominately based on conventional plant breeding supported by technologies such as molecular markers.

Monsanto recentlylaunched a "biotech" product, Performance Series™ Sweet Corn. Performance Series Sweet Corn hybrids provide growers with control of above- and

below-ground insect pests as well as the flexibility and well-established benefits of the Roundup Ready®weed control system. These hybrids have the potential to create sustainable improvements in sweet corn farming through better use of resources and less reliance on chemical insecticides.

Performance Series Sweet Corn provides excellent protection against damage by corn earworm, fall armyworm, European corn borer, and corn rootworm larvae - which translates to more marketable ears per acre. The Bt technology in Performance Series enables growers to reduce insecticide applications by up to 85% when compared with non-Bt sweet corn products. Fewer trips across the field helps farmers save fuel, reduce greenhouse gas emissions, and decrease the carbon footprint per ear of sweet corn. Available for sale in 2012 are conversions of some of our most popular hybrids: Obsession II, Passion II, and Temptation II.

Performance Series Sweet Corn was compared to conventional (non-Bt) and competitive Bt hybrids in 10 large-scale, commercial trials during the 2011 season. Performance Series averaged 13% more crates/acre than the controls, with 97% marketable ears free of insect damage, compared to 86% in the controls.

SWEET CORN PRODUCTION IN SOUTH FLORIDA

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Florida ranks #1 nationally in the production and value of fresh market sweet corn, typically accounting for approximately 20 percent of both national sweet corn production and of U.S. cash receipts for fresh sales.

Sweet corn has typically ranked as one of Florida's four most valuable vegetable crops. During the 2009-10 production season, sweet corn was third in terms of acreage and total value. Harvested acreage for sweet corn represented 15 percent of the state's total vegetable acreage during that season, while production value represented about six percent of the total production value of all Florida vegetables.

A total of 589 million pounds of fresh sweet corn, valued at $189 million, was produced on 42,100 acres in Florida during the 2009-10 season. Florida's fresh sweet corn producing acreage has ranged from a high of nearly 51,300 acres harvested in 1992 to less than 27,000 acres harvested in 2006.

Costs to deliver a sweet corn crop to market vary somewhat, depending upon the production region and other factors. Typically, total costs for a crop range from approximately $3600 - $4500 per acre.

Nearly 20 percent of sweet corn producers overall total direct expenses are invested in pesticides and pesticide application costs.

The principal fresh sweet corn production region in Florida is the Everglades area (Palm Beach County) with over half of the production. The southeastern/southwestern area (Miami-Dade, Collier, and Hendry Counties) were responsible for about a quarter of the state's production. The west/north area (Suwannee and Jackson Counties) account for a minor amount of sweet corn production in the late spring months.

Most of Florida's sweet corn is produced on organic muck soils, with lesser amounts on sandy soils and rockland (limestone) soils. Sweet corn seeds can be planted any time from August through April, depending on the specific production region. However, growers usually plant in north Florida from February to April, in central Florida from January to April, and in south Florida from October to March. Standard spacing allows for approximately 30 inches between rows, with seeds typically planted about one inch

deep, 6-8 inches apart. Maximum plant population is approximately 24,000-32,000 plants per acre. A total of 64-90 days elapses from seeding to harvest.

Since adequate water is especially important in sweet corn production during periods of silking and tasseling and of ear development, almost all of Florida's sweet corn is grown under irrigation.

The principal packing container used in Florida is a wire-bound crate that holds 4.5-5 dozen ears of sweet corn, weighing approximately 42 pounds. Sweet corn is sometimes packed in a waxed fiberboard carton with the same volume as the wire crate. While wire crates are most adapted to hydro-cooling, fiberboard cartons are best adapted to cooling with liquid ice.

Maintenance of appropriate temperature during the post-harvest period is essential for sweet corn, because quality is determined by sugar content and volatile flavor compounds, which decrease rapidly at room temperature. Particularly important is the pre-cooling process of removing field heat from the sweet corn. The most common method of pre-cooling sweet corn in Florida is hydro-cooling by showering or immersion in water. Corn in crates may be hydro-cooled for over an hour to bring it to a temperature of 41F (5C). The entire sweet corn crop in Florida is sold on the open market.

Sweet corn production is largely mechanized. Seeds and fertilizer are mechanically planted/applied, scouts access the fields at appropriate times, and pesticide applications are done either aerially or by ground equipment. Workers have contact with the sweet corn crop only at harvest. Since sweet corn is planted in staggered stages for an approximate eight-month production window, these workers are largely harvesting continuously at a rate relative to market activity.

Sweet corn harvest can occur from mid-November through mid-July, with the most active harvest period occurring from April through May. Sweet corn ears are harvested only once, typically by hand although limited mechanical harvest has been employed. Harvested ears may be packed in the field on a “mule train” type harvest aid or taken to an assembly area in the field or packinghouse for grading and packing. Greater selection for marketable ears can occur with hand harvesting, which usually utilizes self-propelled packinghouses with conveyors.

Florida's warm, humid climate is ideal for the development of pest populations. Sweet corn grown in Florida is subject to damage from numerous insect, weed, disease, and nematode pests.

The most important insect pests on sweet corn in Florida are the fall armyworm, corn earworm, lesser cornstalk borer, cutworms, corn silk fly, cucumber beetles, aphids (corn leaf aphid, bird cherry-oat aphid, melon aphid, rust plum aphid, and potato aphid), and

wireworms. Less common pests of sweet corn include grasshoppers, corn blotch leafminer, twospotted spider mites, sap beetles, stink bugs, maize weevils and billbugs, white grubs, and white fringed beetles. Insect pest management tactics are ever changing in order to incorporate new technologies and to adapt to new pests that are introduced into Florida.

Major diseases of sweet corn in Florida include common and southern rust, northern corn leaf blight, and southern corn leaf blight. Bacterial leaf spot, damping off, and smut are minor diseases, while bacterial stalk rot, Fusarium stalk rot, charcoal root rot, the viral disease maize dwarf mosaic, brown spot, and crazy top are only occasionally seen

Florida sweet corn growers may encounter a variety of grasses, broadleaf weeds and sedges. The major weed pests in sweet corn in the state are amaranths (pigweeds), grasses and purslane.

Although mechanical cultivation remains common, herbicides have partially or completely replaced cultivation, except where surface crusting or herbicide resistant weeds make it necessary.

Florida vegetable growers in general employ sanitation, avoidance, monitoring, and of course suppression practices.

With regard to sanitation, over half of Florida vegetable growers clean implements after fieldwork and nearly half manage water in an effort to suppress pests. Approximately eighty percent remove or plow down crop residue or practice some type of tillage or cultivation to manage pests.
About a quarter of Florida vegetable growers adjust planting/harvest dates to avoid pests or alternate planting locations. Nearly all of the growers in South Florida rotate crops to control pests .

Three-quarters of the growers scouted for pests on 95 percent of the acreage.

With regards to pest suppression, few Florida vegetable growers (less than ten percent) use pheromones or directly release beneficial pests. About a third of the growers use biological pesticides (mostly B.t's) nearly two-thirds alternate pesticides to avoid resistance. Pesticide use is high and the crop may be sprayed daily in some cases.

WHAT VALUE DOES SEED TREATMENTS REALLY HAVE?

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Sweet Corn seed treatments have been around for many years. They are a part of sweet corn culture that is often over looked and taken for granted. It is the intent of this study and talk to explain their value in detail for producing high crop yields and to evaluate some of the newer seed treatments that might have an application in reducing the chemical inputs in growing the crop. One recent seed catalog touts a new non-chemical treatment as being “almost as good” as standard seed treatments in producing even stands and high yields. This is a pretty broad statement and one I took to task in this study to prove or disprove this claim.

For the most part, seed treatments are applied at the seed production facility to assure even application of the seed treatment as well as to ensure that the rates are adequate in order to get the pest control needed and get the job done. Generally, sophisticated equipment is needed to make sure the coating application is even. Seed treatments are used to control many different pests however the two broadest categories would include various insects and diseases. With advent of newer type genetics in sweet corn, the need for new and more effective treatments became necessary particularly since the newer varieties of corn contain considerably less stored endosperm (food reserves) in the seed which is important for seed vigor. This need is especially critical in situations where sweet corn is planted early in less than ideal soil conditions. Captan and Thiram are two standard seed treatments that have been used for sweet corn for many years with great success. These two materials are non-systemic and control a broad range of fungal organisms and can be used on all types of sweet corn genotypes. Maximun is another seed treatment that is especially good at controlling both seed and soil born diseases. Dividen is still another more recent treatment that excels in controlling both Penecillium and Fusarium as seedlings emerge. Since early plantings generally have less than idea conditions and may have higher soil moisture levels, Apron is used as a seed treatment to control Pythium and other water molds that we frequently encounter in New Jersey Soils. Poncho is an effective seed treatment that controls larger soil insects such as rootworms, wireworms, flea beetles and grubs depending on the rate used. These are all important insects here in New Jersey particularly the flea beetles that are apersistent threat here for spreading. Latitude is a planter box treatment that gives control of wireworms and grubs. Grubs are generally not a problem is sweet corn because the fields are generally plowed however as you will see in the slides grubs can be a serious problem even where no-till is not used.

Of particular interest in this study was a new seed treatment called “Natural II” that could be used in organic systems. Natural II has made claims that seem to seem to go

above those normally touted by other seed treatments currently available. For example it is reported to be “an organic, liquid biological seed treatment applied as a film coating and formulated with beneficial microbes, macro and micro nutrients, amino acids, organic acids, enzymes, proteins, vitamins, and minerals” Natural II also is applied to “promote root growth and protect seedlings against soil-born pathogens, improving germination, stand establishment and uniformity” Did you get all that? But what does this really all mean? It is the purpose and intent of this study to hold these claims to the fire with a head on comparison of traditional treated, Natural II treated and totally untreated sweet corn varieties to see how germination and emergence is affected.

This study was conducted at the Rutgers RAREC Research center located outside of Bridgeton, New Jersey. The study was conducted as a randomized, complete block design to eliminate field variability as much as possible. All experimental units consisted of two row blocks of the same varieties. All varieties planted were further subdivided into seed treatments consisting of untreated seed, conventional treatments, and Natural II treatment. Treatments were planted on May 12, 2011 which was not a particularly early planting date as intended. To study the efficacy of seed treatments I would have liked to have the trials planted a month earlier which would stress the plants even more and most likely result in more dramatic test results.

The varieties used for this study ranged from 67 to 81 days maturity. The varieties used in part one of the study were Frisky, Trinity, Fleet, Pay Dirt, Polka, XtraTender 270A. Varieties used for the second planting were Mystique, Lucious, Delectable, Montauk, XtraTender 277A, which are longer season varieties.

Just asearly emergence occurred, it was evident there were going to be highly significant stand differences between varieties as well as the type of seed treatments. Results show that with the variety Trinity that the differencesin stand counts between the traditional chemical seed treatments and Natural II were negligible while the untreated seed showed more than 80% loss in stand count. This variety was very flavorful and made an excellent eating variety. With the variety Fleet the variability between treated and untreated seed was negligible in this study. Apparently this variety might have a greater genetic tolerance to root diseases that make it stand up better to colder, wet, and unfavorable soil conditions. Fleet unfortunately, did not have very good flavor, tended to be tough with a starchy taste. By picking a few days earlier you might improve its eating quality but I felt it was still below that of some other varieties in the test. Frisky was another variety that seemed to have some favorable results with the Natural II treatment however it’s had other undesirable characteristics that would make it not suited to the commercial markets. Both the plants and ears were exceptionally small and not salable. With the variety Pay Dirt, both the untreated seed and Natural II seemed to fall below the accepted standard and had stand losses of more than 74% below the standard treatments. While the ears on Pay Dirt were good eating quality, they were also too small to be of commercial value. The variety XtraTender 270A had by far the most vigor and commercial acceptability of this trial. The plants were

vigorous, healthy and it appeared that there were no real differences between untreated, conventional. This was the only variety in the test that you might possibly be able to plant without any seed treatments. This variety seemed to have some pollination problems that I attributed to the high Oriental beetle populations and by the fact that it was the closet variety planted to the grassy areas that were the primary source of the beetles.

The second half of the sweet corn seed treatment study had tremendous stand pressure from the Oriental beetles to a point that the study had to be abandoned. In the slides you can see that in some areas there were 8-10 emergence holes in a small 6" square area. The mystery to why this happened is puzzling because the field last season was planted with soybeans and had been tilled before planting this year. In New Jersey we have come to expect Oriental beetle grub damage in situations where there is a perennial crop such as blueberries, ornamentals etc and there is no tillage to disrupt the grubs life cycle. Ironically, the evaluation of seed treatments could have been used to determine an effective seed treatment had we realized that grubs could be a problem in this unlikely field situation.

In conclusion, I *feel that the following can be learned from this study*

1) *Overall, the risk of using untreated sweet corn seed is simplytoo great at this time. Conventional Seed treatments are essential if you are not willing to accept stand reductions of 75-80% or greater.*
2) *The organic seed treatment, Natural II seemed to produce acceptable results but only on some varieties and only in situations where the disease pressures are low.*
3) *Some varieties in this study namely Pay Dirt, Frisky and others had ears too small and are not candidates for commercial production.*
4) *The variety XtraTender 270A had strong vigorous plants, ,good ears, and had superior growth habits but lacked some of the better eating quality of the other varieties*
5) *If interested in eliminating sweet corn seed treatments for whatever scientific or philosophical reason, be sure to start small and only plant blocks small enough that you are willing to loose the stand and replant if needed*

DIRECT MARKETING

SESSION

SEASONAL HIGH TUNNELS - A NEW NRCS INITIATIVE

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Through the EQIP Seasonal High Tunnel Initiative, NRCS will assist producers to lengthenthe growing season for high value crops in an environmentally safe manner. A seasonal high tunnel system is a polyethylene (plastic) covered structure that is used to cover crops to extend the growing season. They are used to extend the growing season for crops by approximately two-three weeks on each end of the season by increasing the temperature surrounding the crop and minimizing the heat loss during the night.

Seasonal high tunnel systems, unlike greenhouses, do not necessarily have electrical, heating or mechanical ventilation systems. The seasonal high tunnel system depends on the plastic covering to raise temperatures within the structure. Temperatures during the growing season are controlled by using manual roll-up side vents and by opening end doors to provide ventilation. Unlike greenhouses, seasonal high tunnel systems are considered temporary structures.

Seasonal high tunnel systems installed under the Environmental Quality Incentives Program (EQIP) are not designed for crops grown on tables/benches or in portable pots.Crops are grown by using the natural soil profile.

Criteria for the practice include:
The seasonal tunnel structure must be planned, designed, and constructed in accordance with manufacturer's recommendation. The tunnel frame must be constructed of metal, wood, or durable plastic; and be at least 6 feet in height.
The material shall be of a significant thickness to withstand the temperature modification for the period required. As a minimum, a 6-mil greenhouse-grade, UV resistant polyethylene cover will be used.
In climate conditions where snow loads may damage the structure, the tunnel cover shall be removed or rolled up at the end of the growing season unless the structure is designed to withstand expected snow loads.

Runoff shall be directed away from the tunnel structure to avoid ponding. Runoff may be captured and used for irrigation purposes. Runoff may empty into surface or underground outlets, or onto the ground surface when properly protected. Surface and underground outlets shall be sized to ensure adequate capacity. When runoff from

tunnel covers empties onto the ground surface, a detention basin, storage reservoir, or stable outlet shall be provided. Surface or ground outlets such as rock pads, rock filled trenches with subsurface drains, concrete and other erosion-resistant pads, or preformed channels may be used.

Soil protecting vegetation shall be established on all disturbed earth surfaces.

The EQIP initiative has thepotential to assist producers in addressing a resource concern by improving plant quality, improving soilquality, reducing nutrient and pesticide transport, improving air quality through reduced transportationinputs, and reducing energy use by providing consumers with a local source of fresh produce.

Application Periods: Field offices will accept applications on a continuous basis.
Practice Extent: the maximum practice extent for a Seasonal High Tunnel (798) eligible fora practice payment shall be five percent of an acre per farming operation. This can be single ormultiple structures for a maximum of five percent of one acre coverage.

OPPORTUNITIES FOR FARM TO SCHOOL INITIATIVES

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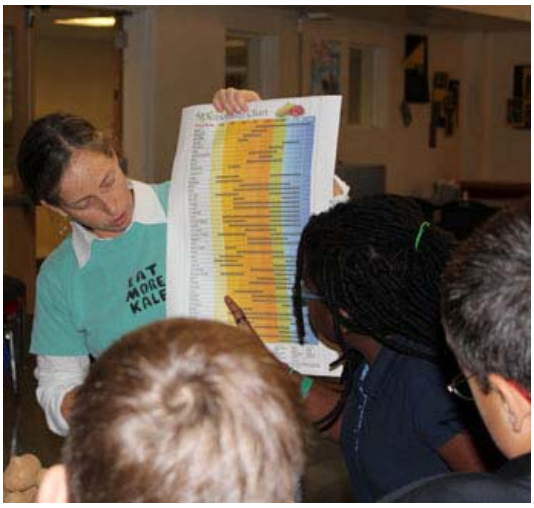
In recent years, the term “farm to school” has gained national attention in the fight to right our nation’s aptly perceived abundance of over processed, high fat foods served to children. In addition to working to increase the consumption of fruits and vegetables, farm to school programs open up marketing opportunities for farms to sell to school districts that previously weren’t purchasing produce with local geographical preference in mind.

Growing the next generation of fruit and vegetable eaters is the goal of farm to school efforts supported by the New Jersey Farm to School Network, the New Jersey Department of Agriculture and school food service professionals across the state. Farm to School programs were celebrated in 2011 in schools across the Garden State as the inaugural “Jersey Fresh Farm to School Week” kicked off the last week in September. Schools participated in tasting contests, recipe development, school garden harvest celebrations and farmer visits, all having to do with NJ grown produce. Visit the “Jersey Fresh Farm to School Week Highlights” link at http://www.njfarmtoschool.org for more pictures and descriptions of what went on around the state.

As well, New Jersey Congressman Rush Holt was responsible for introducing a resolution that has designated October as National Farm to School Month. Farm to School celebrations around the country brought together school food service programs and farm fresh produce, setting a new direction for school meals and health education. Pictured here is Congressman Holt receiving an honor from elementary school garden club students from Hopewell Elementary School.

In 2010, New Jersey Farm Bureau, the NJDA Jersey Fresh Marketing Program and the New Jersey Farm to School Network received funding from a US Specialty Crop Block Grant that enabled them to create a NJ seasonality chart. In preparation for Jersey Fresh Farm to School Week, the chart was sent to 3000 food service directors participating in the National School Lunch Program through the NJDA Food and Nutrition Division. At right, the chart was used at Far Hills Country Day School to teach kids what grows in the Garden State and when.



A visit to a school garden at Princeton's Riverside Elementary School highlighted the importance of school gardens in the effort to inspire healthier eating habits among the nation's school age children. Members of the New Jersey Department of Agriculture and Secretary Doug Fisher as well as representatives from the USDA Mid-Atlantic Region office and the New Jersey Department of Health and Senior Services listened to the story behind this inspirational garden.

New Jersey apples took center stage at a tasting contest at West Windsor Plainsboro School District's Village Elementary School. The entire student body taste tested samples of Red Delicious, Golden Delicious and Macintosh varieties at lunchtime and by far, the selected winner was Golden Delicious.

At Hopewell Valley Elementary School, farmers from Double Brook Farm visited with students and taught hands-on lessons in the school's beautiful school garden. Food Service Director Tony Kowalak visited the farm to discuss seasonality and sourcing with the farmers and food service team members created menu items using produce grown at the farm.

At Jersey City Public School #17, Food Service Director Sue Solleder brought in culinary students from Lincoln Heights High School to work with her staff to create three recipes made with Jersey Fresh produce. "Student ambassadors" were chosen to taste test the recipes and vote for their favorite. Recipes included a sweet potato salad and blueberry crumble.

Plans for next year include a school garden contest and other visits to successful "best practices" farm to school programs around the state. Farmers interested in learning more about selling to schools directly or working with produce distributors to sell to schools can contact the NJ Farm to School Network for more information at 609.577.5113.

The New Jersey Farm to School Network will be hosting a conference on February 24 and 25th at Atlantic Cape Community College in Mays Landing under the theme "It Takes a Village: Collaborations in Good Food and School Gardens". Information can be seen at http://www.njfarmtoschool.org.

FROM FARMS TO SCHOOLS: DEVELOPING VALUE-ADDED AGRICULTURAL PRODUCTS FOR THE SCHOOL LUNCH PROGRAM

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The Rutgers Food Innovation Center has been commissioned by the New Jersey Department of Agriculture to research, develop and determine commercialization opportunities for healthy school menu items made from New Jersey agriculture. The USDA Federal-State Marketing Improvement Program awarded a grant of $51,000 to conduct the research.The project began in October 2010 and will continue through August 2012.

This research is a winning initiative for both farmers and students. Currently, more than 800,000 pounds of fresh locally grown fruits and vegetables are distributed to NJ schools annually. However,since much of the school year does not coincide with the New Jersey agricultural growing season, processing fresh produce into appealing menu items will enable New Jersey schools to serve students healthy lunch and breakfast items made with local agriculture throughout the school year. The project is well underway. To date,the Food Innovation Center and collaborators, within the Rutgers Department of Family and Community Health Sciences, and the New Jersey Department of Agriculture, have researched the parameters that the products must address, such as cost, preparation, nutritional profiles,and taste. Eight product concepts have been developed.They include:
Eggplant Rollatine
Chunky Primavera Sauce
Smooth and Sassy Garden Pasta Sauce
Lasagna Roll-Ups
Asian Chicken Stir-Fry
El Pollo Loco
Jersey Blues Whole Grain Blueberry Muffins
BBerry Breakfast Parfait

The impact of this project can be very significant, in that it creates an innovative new sales venue for farmers and provides children with delicious new healthy menu choices in school.
The goals and objectives of the initiative are:

1. Develop value-added agricultural products that meet nutritional & cost requirements of the National School Lunch program

2. Evaluate the potential suitability of value-added produce items for vending machine distribution in schools
3. Conduct consumer research that demonstrates product sensory acceptance by school children of various age groups and preparation and distribution by School Food Service Directors
4. Conduct analytical research that demonstrates acceptable product shelf life
5. Identify New Jersey agricultural producer(s) who will supply and will market the value-added products for the program's products
6. Identify processors who can commercialize and manufacture products for sale to the New Jersey school system
7. Prepare and disseminate fact sheets to school food service directors; prepare and execute marketing plan

To date, research has been conducted through surveys and focus groups with food service directors across the state to understand their needs and challenges. Based on Food Service Director input, and the products and capabilities of New Jersey growers, a complement of value-added product concepts have been developed (as noted above). They included vegetable and fruit based products that meet the nutritional and food service requirements of the school food service program. Immediate next steps include administering sensory testing with students to determine their acceptance, finalizing formula and production, and conducting shelf life analysis and product costing. Based on this research, three products will be selected and tested in the City of Vineland'sschool district for six weeks.
This program presents a new sales venue for New Jersey agricultural producers. School districts throughout the state are highly interested in sourcing and serving healthy food products to their students made with Garden State agriculture.

5 PRINCIPLES OF WEB MARKETING FOR FARMERS

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I have been working on some guiding principles for farm web marketing over the past 6 months. These are honest, down-to-earth principles for farmers to help make decisions for what marketing opportunities to spend time on and how to approach this part of your business. These aren't recycled from other industries or the same old boiler-plate: these are principles gathered from helping start and run a CSA farm operation myself and conversations with hundreds of farmers over the past five years with Small Farm Central.

This is a framework to change your mind that web marketing is *hard* and not worth your time. This part of the farm work should be fun and, if you are a direct marketer, as important as farm chores.

The following are the 5 principles:

#1 Be Yourself / Be Authentic

- Find your own voice and let that voice speak on the website – the more fun you have the more fun your customers will have.
- Use the tools that make sense to you: you don't have to start Twittering just because someone told you that you *have to*. Start simply with a website and an email mailing list and add tools from there.
- Facebook is a good tool for communicating with your fans. Connect your facebook page with your website so when you keep your facebook page updated your website stays updated too.
- Get your customers excited about your work!

#2 Promote

- Search google for your farm name: are the results good enough for your purpose?
- Just having a website and web presence is not enough, you need to tell people about it!
- Quick ideas: put your website address on the footer of all emails and on your business cards. Tell customers to visit the website whenever they have a question that can be answered in more detail there.
- List your farm on farm directories like LocalHarvest, Eat Well Guide, and any local directories.

#3 Clean Navigation

- Show your website to family and friends that are not directly involved in the business: can they find information easily?
- Use keywords on your website like “contact”, “about us”, “FAQ” so customers can quickly navigate.
- Get your “dot com” like yourfarm.com so people can easily find you.
- Use personas to guide development: think about the different types of customers that may visit your site (ie retail vs. restaurant customers). Are they served well?

#4 Keep it Fresh

- Make it easy to keep your website fresh. If you make it easy, you are more likely to do it in the height of the season.
- Tend your web presence like a garden: a little attention each week goes a long way.
- Make a schedule. Plan to work on your web presence every Tuesday from 9am-10am for example and try to stick to that.

#5 Your story is interesting

- Your customers often work office jobs and any story you can tell from the farm will likely be interesting to them even if fixing irrigation equipment, for example, sounds humdrum to you.
- People are attracted to passion: tell your story with passion and customers will listen.
- Take pictures. A picture connects someone to the farm faster than a 10 page essay on your growing philosophy.

THE IMPACT OF FOOD BLOGGERS ON MARKETING YOUR PRODUCTS

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The concept of using any and all methods to promote and sell products devised by Jay Conrad Levinson continues to evolve since he wrote his classic book *Guerrilla Marketing – Secrets for Making Big Profits from your Small Business* in 1984. Many authors and marketing consultants have added to the ideas that Levinson fashioned, including our own Bob "Matty" Matarazzo who adapted the model to farm direct marketing in his own book, *Marketing for Success: Creative Marketing Tools for the Agricultural Industry* (1996).

Today, entrepreneurs have all the tools described by Levinson and Matarazzo, as well as all the new tools available via the internet and the World Wide Web. And beyond static web pages and email, the new interactive tools of Social Media open tremendous possibilities for reaching out to new customers, communicating with regular clientele, and gaining almost instant feedback about the business and product offerings.
One of Matty's most effective 'tricks of the trade' was to develop a mailing list of newspaper editors and reporters whom he kept supplied with regular updates via press releases. Like many of these savvy marketing techniques, it costs very little, if anything, to reach consumers via the internet, except time. When it got to be more than he could handle along with managing the farm production, a farm market and a winery, he hired someone to take on the responsibility to keep those reporters supplied with news about those business enterprises.

The same is as true today about using Social Media as it is to maintain contact via press releases. It's great if you have time to tell your story via a blog, on FaceBook or Twitter, but what if you just don't have the time, the wherewithal, or the urge to start typing about your business, are there options? You can hire a web marketer to try to tell your story, or you might consider sending your news to an established food, travel or news blogger.

Just like the restaurant critique by a local food writer, it's a more credible story if bloggers who have nothing to do with your business write about you and spread the word to their thousands of followers? So in addition to the traditional media types that you might contact about a news event, consider inviting a blogger to your farm to help you tell your story? An internet search for food/farm/travel blogs about your town/state will turn up a surprising list that you can add to your media (e-) mailing list. The following

lists, mostly from the Blogroll on the Eating in South Jersey blog (www.eatinginsjersey.com - We're not food critics; we're food enthusiasts) will help get you started.

Many thanks to Pam Sauerwald, Rutgers Cooperative Extension of Atlantic County Office Services Manager for her assistance in searching the internet to compile this list.

Food Lovers

1 Wine Dude	1winedude.com
22nd & Philly	22ndandphilly.blogspot.com
A Tale of Two Spoons	taleoftwospoons.blogspot.com
All I Eat Food	allieatfood.com
Amiable Life	amiablelife.com
Basil Bee	thebasilbee.blogspot.com
Bathtub Brewery	www.bathtubbrewery.com
Beer-Stained Letter	beerstainedletter.blogspot.com
bridges, burgers & beer	bridgesburgersbeer.com
Caviar & Codfish	caviarandcodfish.com
Chew Jersey	chewjersey.wordpress.com
Collingswood Foodies	collingswoodfoodies.com
CookAppeal	cookappeal.blogspot.com
Cybele Connor – Food Geek	cybeleconnor.com
Down-Home South Jersey	downhomesouthjersey.com
Dine with Pat	Dinewithpat.com
EthnicNJ	ethnicnj.com
Family, Friends and Food	familyfriendsandfood.blogspot.com
Food Coma	afoodcoma.com
foodaphilia	afoodaphilia.com
French Fry Diary	frenchfrydiary.blogspot.com
Garden State On A Plate	gardenstateonaplate.blogspot.com
Gluten Free Philly	glutenfreephilly.com
House Hubbie's Home Cookin'	househubbie.blogspot.com
Jennifer Wickes	jenawix.wordpress.com
Jersey Bites	jerseybites.com
Jersey Foodies	jerseyfoodies.blogspot.com
Jersey Girl Cooks	jerseygirlcooks.com
Jersey Girl in the Kitchen	jerseygirlinthekitchen.blogspot.com
Jerseygator's Blog	jerseygator.wordpress.com
jerzEATS	jerzeats.com
La Phemme Phoodie	laphemmephoodie.com
Ladyberd's Kitchen	ladyberds-kitchen.blogspot.com
Life of Spice	mbhide.typepad.com
Light Fare	lightfare.blogspot.com

Messy and Picky	www.messyandpicky.com
New Jersey Nick	newjerseynick.com
NJ Epicurean	njepicurean.blogspot.com
NJ Wines Uncorked	njwinesuncorked.com
Off The Broiler	offthebroiler.wordpress.com
Partners In Wine Club	partnersinwineclub.wordpress.com
Philly Foodie	phillyfoodie.com
Random Cravings	randomcravingsblog.com
Second Helpings	secondhelpings.org
Simply Beer	www.simplybeer.com/blog
SoJerz Phood Blog	www.southjerseyfoodie.com
South Jersey Foodie	www.southjerseyfoodie.com
South Jersey Locavore	www.southjerseylocavore.com
South Jersey Wine & Dine	ballymote.wordpress.com
Spoon & Shutter	spoonandshutter.com
Stacey Snacks	www.staceysnacksonline.com
Sweet Life Bakery	sweetlifebakery.wordpress.com
Tara Nurin	taranurin.wordpress.com
Taste As You Go	www.tasteasyougo.com
TheGritsnCheeseDish!	thegritsncheesedish.blogspot.com
Tiny Kitchen Creations	www.tinykitchencreations.com
Uwishunu	www.uwishunu.com
Wing Quest	wingquest2011.blogspot.com

Other Jersey Blogs

a lovely shore breeze…	caitesdayatthebeach.blogspot.com
A Mom Writing	amomwriting.blogspot.com
All Things Gwen	allthingsgwen.com
Another Delco Guy in South Jersey	cavalier92.typepad.com/anotherdelcoguy
Down the Shore with Jen	downtheshorewithjen.com
NJ Mommy Poppins	www.newjersey.mommypoppins.com
New Jersey Moms Blog	www.newjerseymomsblog.com
SableMinded	sableminded.net
SoapBoxville	www.pagliotti.com/newsoapbox
Tales of the New Jersey Shore	talesofthejerseyshore.blogspot.com
the cuteness of curiosity	jellypuff.blogspot.com
Where is the line between N & S Jersey	nsjersey.blogspot.com
You Don't Know Jersey	www.youdontknowjersey.com
NJ Wild	www.packetinsider.com/blog/nature
Wild New Jersey	wildnewjersey.tv

TOMATOES

SESSION

USING WEB-BASED DISEASE PREDICTION MODELS

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The idea of computer based wide area monitoring for agricultural pests has been developing for some time now and there are many state and regional programs, public and private, across the country that help farmers manage crop pests. Andy Wyenandt, Rutgers Specialist in Plant Pathology and I are promoting the use of these systems.

With the improvement of technology and access to the internet it is now possible for farmers to directly connect to these sites for either a nominal fee or for free to obtain weather information and access to models for plant pest control. There are also private consultants who provide this service as well. Probably the most useful of these models is for management of plant pathogens, such as Tomcast (tomatoes, carrots) and Blitecast (potatoes, tomatoes), for example. While plant disease models are the most useful for the majority of growers, there are also models for predicting insect pest activity as well as tracking weather factors and growing degree days.

One of these sites is US Pest (www.uspest.org), based in Portland, Oregon. They of course emphasize the western US growing conditions and pests, but provide real time data for the entire US including New Jersey.

What is available at US Pest for New Jersey farmers?

- many (152+) local weather stations
- degree-day accumulations
- disease models for Tomcast and Blitecast and others based upon degree-days and rainfall
- insect models of life stage occurrence (these are of limited use because they are largely for insect pests typical of the northwestern US)
- tutorials on how to use the website functions
- no sign-in necessary though you may set up a specific account

This network is funded by subscriptions and contracts with US Forest Service and other agencies.
Cost to the individual user: free

Another site which is New Jersey specific is the Network for environment and weather applications, (http://newa.cornell.edu/) This is a more local network originating from Cornell University and provides data for New York, New Jersey and New England.

What is available at NEWA for New Jersey farmers?

- 43 local weather stations
- local weather 7 day forecasts
- degree-day accumulations
- plant disease models and alerts (Tomcast, Blitecast, cucurbit downy mildew) based upon degree-days and rainfall
- insect models of regional insect pests
- no sign-in necessary

This network is funded by subscriptions by institutions.
Cost to the individual user: free

How can farmers use this information? You can access the websites on your own and see how they work. The most critical thing is that you are able to locate a weather station that reflects your local weather. Because a weather station is close to your farm does not necessarily mean that it will best represent your farm conditions. This will be more of a problem in northern New Jersey because of the hills and low mountains. Once this is determined you can download the relevant weather/degree-day/model data that you desire.

Another option would be to receive this information via email from Rutgers Cooperative Extension. Beginning this year, the Tomato Fax and Potato Fax reports which have mainly provided disease forecast/management information, will be reporting weather and disease conditions from selected weather stations around the state. Farmers have the option of looking up their own farm data or subscribe to the reports.

In another change, the Tomato Fax and Potato Fax reports will no longer be sent out as faxes but as emails. So to subscribe you will need to supply an email address for the 2012 season. There is no charge for this service. You can subscribe to either of the reports by sending an email message to me at mahar@njaes.rutgers.edu including your email address.

TOMATO POLLINATION IN EXTREME COMDITIONS

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Blossom drop and reduced fruit set in tomato can seriously impact yields. Growers in the USA routinely experience such problems and inquire about the cause and possible preventative measures to reduce flower loss and improve yields under extreme temperatures. The problem can be frustrating and difficult to manage under some situations.

Tomato flowers are complete flowers in that they have both male (stamens) and female (pistil) parts within the same flower. The 'yellow' stamens wrap around the 'greenish' pistil in the center of the flower (Mills, 1988). The stamen has two parts: filament and anther and the pistil has three parts: ovary, style and stigma. The style is the long stalk reaching up to the bumpy and sticky stigma, which extends beyond the surrounding stamens. Tomatoes are self-pollinated at the rate of 98% or more. Pollination occurs primarily between 10 am to 4pm during the day (Levy et al., 1978). Tomatoes need biotic or abiotic agents to assist in pollination.

Open-field production: Abiotic agents can be wind with open-field tomato production. Shaking by wind or mechanical means stimulates the release of the pollen, which drops down (the blossoms normally hanging downward) through the stamen tube to the stigma. In tomato flowers are unique since the anthers (which hold the pollen grains) are located far lower and inside the flower than the stigma (which receives the pollen grains to form fruits). Insect pollinators are not important for pollination of tomatoes grown in open field production (Levy et., 1978; Ozores- Hampton and McAvoy, 2010).

Blossom drop is defined as the loss of flowers. Several factors, usually related to some type of stress, can cause tomato plants to drop their blooms. The stress may be either nutritional, environmental or a combination of the two. However, anything which interferes with the pollination-fertilization process may result in flower loss (Mills, 1988; Levy et al., 1978; Ozores-Hampton and McAvoy, 2010). Without pollination, which stimulates fruit set, the flowers die and drop. This condition can affect tomatoes, peppers, snap beans, and other fruiting vegetables. In tomatoes, blossom drop is usually preceded by the yellowing of the pedicle. Tomato flowers must be pollinated within approx. 50 h (2 days) or they will abort and drop off. This is about the time it takes for the pollen to germinate and travel ups the style to fertilize the ovary at temperatures above 55^{o}F.

Potential Causes of Blossom Drop

The primary causes of blossom drop in tomatoes are environmental; such as temperature and relative humidity (RH) or cultural; such as the lack or excess of

nitrogen (N) fertility. The secondary causes can be lack of water, reduced or extended light exposure, excessive wind, insect damage, foliar disease, excessive pruning or heavy fruit set.

Primary causes of blossom drop

1. Temperature: Under extreme temperature regimes, such as high day-time temperatures (above 85°F), or high night time temperatures (above 70°F), or low night-time temperatures (below 55 °F), tomato plants will drop their flowers. Optimal growing conditions for tomatoes are daytime temperatures between 70°F and 85°F. While tomato plants can tolerate more extreme temperatures for short periods, several days or nights with temperatures outside the optimal range will cause the plant to abort flowers and fruit, and focus on survival (Mills, 1988). Temperatures over 104°F for only four hours can cause the flowers to abort. If the night temperatures fall below 55°F or rise above 70°F or if the day temperatures are above 85°F, the pollen becomes tacky and non-viable, then pollination doesn't occur and the blossom dries and drop Levy et al., 1978; Chester, 2004; Mills, 1988; Ozores-Hampton and McAvoy, 2010).

Low temperature*:* Low temperatures interfere with the growth of pollen tubes preventing normal fertilization. The pollen may even become sterile, causing blossoms to drop. Tomato fruit will not set until nighttime temperature is above 55 °F for at least two consecutive nights (Chester, 2004; Ozores- Hampton and McAvoy, 2010).

High temperature*:* Due to the sustained high temperatures, especially at night, the food reserves in the tomato produced during the day are rapidly depleted. The result is sticky pollen, altered viability and poor or no pollination. Ultimately the blossom dries and falls off. Female flower parts can also undergo morphological changes such drying of the stigma (Mills, 1988; Ozores- Hampton and McAvoy, 2010.

2. Relative Humidity: The ideal RH for tomatoes growth and development ranges are between 40 to 70%. Relative humidity plays major role in pollen transfer. If the RH is lower than optimal, it will interfere with pollen release as the pollen is dry and unable to stick to the stigma and if RH is higher than optimal the pollen will not shed properly. (Mills, 1988; Ozores- Hampton and McAvoy, 2010).

3. Nitrogen: High or low application rates of N fertilizer can cause blossom drop. High rate of N encourages the plant to produced excessive vegetation at the expense of fruit set. Low N produces spindly vines with low food reserves that cannot support a tomato crop (Levy et al., 1978; Chester, 2004; Mills, 1988; Ozores-Hampton and McAvoy, 2010).

Secondary potential sources of blossom drop

Low or high soil moisture: Tomatoes have deep roots that can penetrate up to five feet. Low soil moisture will stress and weaken the plants. The root zone should be kept uniformly moist throughout the growing season to develop a large root system and reduce plant stress (Chester, 2004; Ozores- Hampton and McAvoy, 2010).

Heavy fruit set: When a tomato plant has produced a large amount of blossoms, the resulting fruits compete for the limited food supplied by the plant. The plant will automatically abort some flowers. Once the initial crop is harvested, the problem should subside as the plant nutritional status comes into balance. (Levy et al., 1978; Mills, 1988; Ozores- Hampton and McAvoy, 2010).

Wind/pruning: Excessive wind will desiccate flowers and/or physically knock off flowers reducing fruit set. Excessive pruning can reduce the amount of energy the plant can produce and thus reduce yield, can expose the tomatoes to excessive sun and thus cause sunscald.

Light: Lack of sufficient light or extended exposure to light can reduce fruit set.

Insect damage or disease: Gowers should use adequate cultural practices and control insects and diseases. Fungal diseases such as botrytis or heavy bacterial spot or speck pressure will have a negative effect in fruit set.

How to Control Tomato Blossom Drop

1. Grow varieties suited to your climate
2. Ensure pollination
3. Used recommended N rates
4. Water deeply during dry weather
5. Control insect and diseases

Under high temperatures and low RH: Under controlled production situations (greenhouses), directing a gentle spray of water at the blossoms twice during a hot day will improve flower set when daytime temperatures range between 90° and 100° F and below 75° F at night. The evaporating moisture lowers the temperature, raises the humidity and jars the pollen loose, therefore improving flower set. If daytime temperatures exceed 100 ^{o}F and night temperatures above 75° F, this technique is not effective.

Under high temperatures and high RH: Water application to the foliage is not recommended especially when fungus diseases are present.

In conclusion, temperature and RH are usually out of the grower's control. Sometimes the only thing you can do is to wait for favorable weather conditions. If weather

conditions are optimal and other growers are not having flower and fruit set problems, the grower should consider cultural causes of tomato blossom drop and poor fruit set. Selecting a suitable tomato variety, adequate N fertilizer and water and controlling insect and diseases will potentially insure high tomato yields. In Florida, during the early fall growing season, growers can get around the heat issue by selecting heat tolerant varieties.

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EXPERIENCES IN GRAFTING TOMATOES FOR DISEASE RESISTANCE IN NJ

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Many studies have shown that grafting non-disease resistant tomato varieties onto disease resistant rootstocks can improve plant growth and yield. One grower study in Pennsylvania also showed a yield response when a disease resistant variety was grafted and planted into fumigated and non-fumigated soil in a high tunnel. In order to verify that grafting can enhance yield even without the presence of disease in a high tunnel, a study was conducted in the research high tunnels at the Rutgers Agricultural Research & Extension Center (RAREC) in 2011. In this study four varieties of tomatoes (BHN589, Primo Red, Red Deuce, and Scarlet Red) were grafted onto Multifort rootstock and compared with ungrafted plants. The treatments were planted into bags of clean soilless mix to eliminate the possibility of soil borne disease. The yields of all four varieties were higher for the grafted plants than the ungrafted plants (Figures 1. & 2.). Unfortunately, the yields and fruit quality from the plots were somewhat low due to a problem with a lack of surfactant in the bag mix. Funding is being sought to repeat this experiment to confirm the findings.

Figure 1. Marketable yield from high tunnels RAREC, Bridgeton, NJ 2011

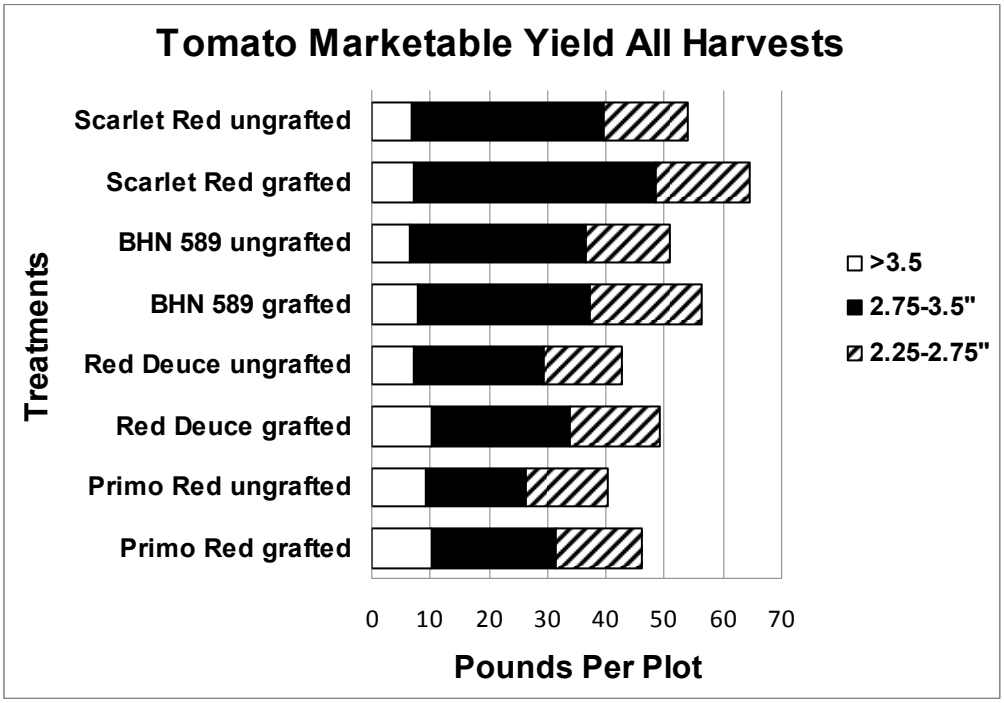
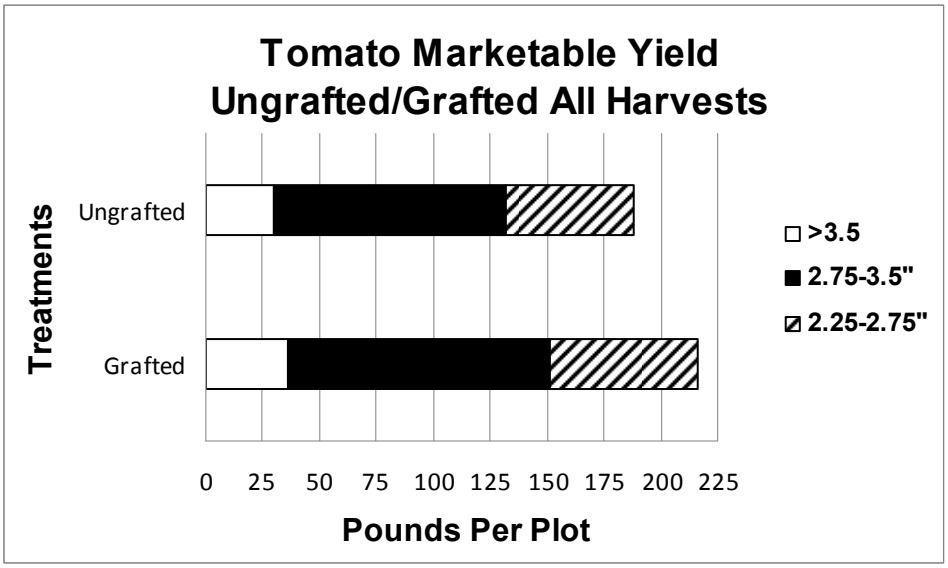


Figure 2. Marketable yield from all varieties combined RAREC, Bridgeton, NJ 2011



Several New Jersey farmers have been experimenting with grafting tomatoes for production in high tunnels. Overall their experiences have been favorable and details of their experience will be shared during the presentation.

BEST MANAGEMENT PRACTICES FOR TOMATO FERTILIZATION

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[2]University of Florida/IFAS/HOS, Gainesville, FL.[3]Manatee
County Extension Service, Palmetto, FL.
[4]Hendry County Extension Service, LaBelle, FL.

Florida is an important production area for winter fresh-market tomatoes with approx. 38,000 acres been planted annually (NASS, 2009). The vegetable production system in Florida, which typically incorporates raised beds, polyethylene mulch, drip or seepage irrigation and an adequate quantity of N-P-K, has been very effective in producing high vegetable yields (Olson et al., 2010). But, nitrogen (N) fertilizer management has become an issue of environmental concern for Florida vegetable growers with the adoption by the State of vegetables BMP [(Best Management Practices) http://www.floridaagwaterpolicy.com/PDF/Bmps/Bmp_VeggieAgroCrops2005.pdf

The BMP manual for vegetables endorses UF-IFAS recommendations of 200 lb/acre of N in tomatoes (plus provisions for supplemental fertilizer applications. In addition to 'basic' fertilizer applications, supplemental fertilizer applications are allowed for tomato in the UF-IFAS recommendations (Olson et al., 2010) and in the BMP manual (Simonne and Hochmuth, 2003) under three situations. When a UF-IFAS irrigation recommendation is followed, supplemental fertilizer applications are allowed (1) after a leaching rain (defined as 3 inches in 3 days or 4 inches in 7 days) for crops (including tomato), (2) under extended harvest season, and (3) plant nutrient levels (leaf or petiole) fall below the sufficiency range (Olson et al., 2010). Nutrient management in tomato production is not limited to the total amount of fertilizer found in the recommendation. Together with rate, the effectiveness of nutrient management depends on fertilizer placement, source, growing season, irrigation methods and application time. With drip irrigation, typical fertilization practices consist of applying 25% of the total N and K_2O rates broadcast on the bed area, while 100% of P_2O_5 and micronutrients are applied pre-plant. The remaining 75% of both N and K_2O are injected through the drip tape. In some cases, a fertilizer wheel is also used to supply additional fertilizer. For tomato grown with seep irrigation, approximately 25% of the fertilizer is applied broadcast in the bed (bottom or 'cold mix'). The rest of the fertilizer is applied is two bands on the shoulders of the bed ('hot mix'). Water rising by capillarity slowly dissolves the fertilizer band and supply nutrients to the crop. In some cases, the fertilizer wheel is also used.

Recent unpublished surveys by IFAS personnel indicate that most growers do not follow IFAS N recommendations. Major growers' critique of current IFAS nutrient management includes the lack of large scale on-farm field research in southwest

Florida, lack of N recommendation for drip irrigated tomatoes of more than 13 weeks, introduction of new varieties that support greater crop yields, and a direct correlationbetween higher N rates and lower incidence of plant diseases (Cantliffe et al., 2006). Many growers believe that UF-IFAS fertilizer recommendations are too low to produce economical yields, especially during wet years. On many operations, N rates are reported to be 150% of the UF- IFAS recommended rate. In addition, growers admit they tend apply irrigation in excess of crop evapotranspiration (ETc), which is the recommended water management practice. Although N runoff has not been identified as a widespread problem in south Florida, the environmental concern remains that the combination of over-fertilization and excessive irrigation may contribute to elevated nutrient concentrations in ground and surface waters.

But, with the development of nutrient BMPs for vegetable crops, N recommendations must be high enough to ensure economical yields, but not excessive as to minimize the environmental impact of tomato production. The current UF-IFAS N fertilization rate of 200 lbs/acre of N (with supplemental fertilizer applications under specified conditions) may need to be increased accordantly to tomato growers. Therefore, the objectives of the project were to establish partnerships with selected SW Florida tomato growers to evaluate the effects of N applications in yield, plant growth, petiole N sap, insects and disease incidences. In cooperation with commercial tomato growers 36 on-farm trials were conducted during 2004 and 2011 compared IFAS vs. growers (200 vs. 400 lb/acre) and 4 N rates seepage trials ranged from 20 to 420 lb/acre.

Results and Discussions

Routine sap NO_3-N and K were above published sufficiency ranges in all the trials and seasons when compared IFAS vs. growers. Nitrate concentrations of petiole sap NO_3-N decreased over time following a typical pattern observed in seepage irrigated tomatoes when N rates ranged from 20 to 420 lb/acre (Ozores-Hampton et al., 2007). In general, during the season when soluble N fertilizer was used there were between 90 to 300 boxes/acre more in total marketable yields with higher N rates, although the differences were not significant when compared IFAS vs. growers ($P \leq 0.05$). Extra-large and total marketable fruits yields showed a quadratic plateau response to N rates with maximum yields at two harvests (97 % of the yields) between 153 to 266 lb/acre. During subsequent ripening N rate did not correlate consistently to fruit ripening rate, fruit firmness nor compositional quality at table-ripe stage. The high value of tomatoes relative to the cost of N fertilizer created a situation where the profit maximizing rate of N was not significantly different than the production maximizing N-rate. Whether or not the profit maximizing level of N was higher or lower than the UF/IFAS recommended rate depended on the growing season. With favorable growing conditions, conditions such as these in 2008, a grower's net return would have reduced by between $2,470 and $4,940 per acre depending upon market conditions. If, on the other hand, the UF/IFAS recommended rate of 200 lb/acre resulted in the highest yield, applying upwards of 268 lb/acre would have increased grower production costs by at least $165 per acre. While fertilizer costs are known before the crop is grown, tomato prices are

realized only at the end of the growing season and profit margins can only be calculated after the fact. These results may be useful for growers to determine the optimal N rates for production and profit, and by State agencies to understand the potential effects when N rates are reduced. The BMP trials are a popular on-farm research project were growers and IFAS cooperators work as a team. Together the cooperating farms represented 30,000 acres (80%) of staked tomato production in southern and eastern Florida with 650 acres and $1.3 million in-kind contribution under BMP experiments.

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NEW JERSEY AGRIBUSINESS ASSOCIATION

SESSION

NEW JERSEY AGRIBUSINESS ASSOCIATION - WHO WE ARE AND WHAT WE DO

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NJAA is a professional organization whose purpose is to foster communication and cooperation among members of the agricultural industry in New Jersey by providing professional improvement opportunities to our members to enhance the public image and understanding of agriculture today.

We are individuals and organizations concerned with all agricultural issues within the State of New Jersey. Typically, we are a combination of industry professionals and Extension personnel. All persons with an agricultural affiliation are welcome.

Objectives of the Association are as follows:

1) Promote safety in all phases of agricultural activities.
2) Promote the benefits of a strong agricultural industry as related to the environment and the entire community.
3) Distribute factual and research-based information on agricultural products and services.
4) Promote and support scientific investigations of agricultural products and services.
5) Promote understanding, cooperation and ethical practices among those concerned with agricultural issues.
6) Conduct educational and public relations programs for the public to understand the need for agriculture in the state.
7) Inform the membership of legislation or regulations affecting the agricultural industry.

In addition to monthly Board of Directors' meetings we have four open meetings a year. Anyone with a vested interest in agriculture is invited to attend. They are the:

- Spring Educational Tour – In March we visit production farms and agribusinesses to learn more about the agricultural industry.
- Weed Management Field Day – In July we participate in the Weed Management Field Day and Trials aat the Rutgers Agricultural Research and Education Center (RAREC) in Bridgeton, NJ.
- Annual Summer Tour – At the end of the year we visit an active area of agriculture or agribusiness in the afternoon and have dinner together.
- Annual Meeting- In late November or early December we have an series of educational sessions offered in conjunction with Rutgers Cooperative Extension.

As an association, we also offer some awards and two scholarships each year. We are proud to recognize outstanding individuals, businesses or organizations affiliated with the agricultural industry in New Jersey.We offer:

- The Stephen A. Johnston – Person of the Year Award: An individual who has gone above and beyond the call of duty to serve the agricultural industry in New Jersey.

- The Business of the Year Award: An agricultural business, agency, association, or organization that stands out in the area of service to the agricultural industry in New Jersey.

- The Heritage Award: This honors an individual who has spent many years of their career and livelihood serving the agricultural industry in New Jersey.

The scholarships are known as the Edward A. Platz Memorial Scholarship. Each year we offer two $1500.00 awards that are open to NJ residents majoring in an agricultural subject area at a 4-year college or university in the United States with a career goal in agriculture.

Membership in NJAA opens up a world of information and service to you and your business! You will benefit from professional meetings and training events.
You will have networking opportunities with industry liaisons, as well as legislative, professional, and social affiliations that can serve you for years to come.

Membership
Our low membership fee of $25.00 per year, make joining the NJAA easy and affordable.

HOW DO MOTOR VEHICLE REGULATIONS IMPACT ME AS A FARMER?

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Farming is a business, and as business owners, farmers need to know how the federal and State motor vehicle laws and regulations impact the use of the vehicles used in their commercial business. The laws and regulations may change and farmers need to keep up-to-date on these changes. Below is a summary of the "hot" topic issues raised by farmers as it relates to motor vehicle regulations.

Student Ag Drivers License: Students with an agricultural license are subject to the graduated driver license (GDL). Legislation is pending to modify the law; however, as it stands, the student can only drive a vehicle with a 'farmer' or 'farm use' plate in the pursuit of agriculture, which means solely conducting errands for the farm. They are prohibited from driving the farm vehicle for personal use and prohibited from driving any other type of vehicle. They must be accompanied by an adult supervising driver at least 21 years old and licensed to drive for at least 3 years (does not apply when driving a farm tractor); no driving between 11:01 p.m. and 5:00 a.m.; no cell phones, hand held video games or any other hand held electronic device; passengers shall be limited to persons who share the permit holder's residence and one additional passenger who does not reside with the permit holder; and seatbelts must be worn.

'Farmer" & 'Farm Use' Plates and Farm Tractors: A 'farmer' and 'farm use' plate is designated a commercial plate - it is used to transport goods or merchandise. As such, NJ law requires that the name of the farm (no less than 3 inches in height) and municipality be placed on the side of the truck. If the vehicle is 26,001 pound or more, the gross vehicle weight rating (GVWR) must be displayed. These vehicles can now be used for personal use but they cannot be used for-hire.

Vehicles with a 'farm use' plate are restricted to a travel distance of 15 miles from the farm; and the vehicles cannot be operated on the highway between sunset and sunrise, when visibility is limited to 500 feet, or when there are hazardous road conditions, such as snow or ice. There are no travel distance limits on a vehicle with a 'farmer' plate. Nevertheless, if you travel interstate with the 'farmer' plate vehicle, be certain the other state recognizes the plate as valid. Some states may not recognize New Jersey's 'farmer' plates.

Registration is not required for farm tractors that cannot be operated at a speed in excess of 20 miles per hour. A farm vehicle registered with a 'farmer' or 'farm use' plate cannot be operated on a highway when the vehicle, including load, exceeds eight feet in width and/or 50 feet in length unless four red flags are displayed on both the front and rear. Any farm vehicle, implement or machinery and/or load that exceed 12 feet in width and/or 60 feet in length, in addition to the four flags, must have one escort vehicle and cannot be operated on the road on Sundays and holidays. A rule is pending adoption that will allow movement on Sundays and holidays.

USDOT Number & Unified Carrier Registration (UCR): If a truck or truck combination (including pickup with trailer) is used for commercial purposes, travels interstate and has a GVWR of 10,001 or more, the vehicle must have a USDOT number and must be registered with the UCR. First secure a USDOT number by visiting www.fmcsa.dot.gov/forms/usdot/Dotno.htm (no fees assessed) and when this task is completed, visit www.ucr.in.gov to register with the UCR (fees are based on the number of vehicles that travel interstate and start at $76).

Medical Card for Drivers of Commercial Motor Vehicles: Any driver of an articulated vehicle that travels interstate or intrastate with a GVWR of 10,001 or more must have a medical certificate to show that the driver is physically qualified to drive the vehicle. Farmers and their employees may be exempt from the CDL, but they are not exempt from the medical certificate requirement. The certificates are good for two years and can be issued buy a licensed medical examiner.

Commercial Motor Vehicle Inspection: Every motor carrier must systematically inspect, repair, and maintain, all motor vehicles. The following equipment must be inspected and maintained: brake lines and lining; drive lines; coupling devices; tires, wheels and flaps; springs; emergency equipment; fuel system; cooling system; lighting devices, horn and mirrors; transmission; steering equipment; axles and tie-rod assemblies; clutch; exhaust system and exhaust emissions; and glazing and wipers. The records shall be retained where the vehicle is either housed or maintained for a period of 1 year and for 6 months after the motor vehicle leaves the motor carrier's control.

Roadside Inspection: State Police and Motor Vehicle Commission (MVC) examiners may perform inspections of the vehicles on the road. If during the inspection it is found that the vehicle has a mechanical condition or loading that may cause a breakdown or an accident, the vehicle can be placed “out of service”. Any vehicle marked “out of service” cannot be operated until all repairs have been satisfactorily completed. Although a diesel powered truck with ‘farmer’ plates and a GVWR of 8,500+ pounds is exempt from the periodic diesel emission inspection, if a State Trooper or MVC examiner sees evidence of the vehicle emitting smoke, the vehicle can be pulled over. A citation can be issued that carries fines from $250-$1000 per day per vehicle.

International Fuel Tax Agreement (IFTA): IFTA simplifies the reporting of fuel use by motor carriers that operate in more than one state. The carrier must file quarterly fuel tax reports. Farmers are exempt from IFTA if the truck does not leave New Jersey. However, if the truck travels interstate and has two axles and a GVWR of 26,001or more, a GVWR of 26,001or more in combination or has three or more axles no matter what the weight, an IFTA sticker is mandatory (cost $10 per vehicle).

Additional Information: The NJ Department of Agriculture has posted a web site that provides more details on federal and state motor vehicle regulations that affect farmers. Visit http://www.nj.gov/agriculture/divisions/md/prog/farmermotorvehicles.html for more details. For questions or more information, contact Karen Kritz at 609-984-2506 or karen.kritz@ag.state.nj.us.

CREATIVE AG ON THE FARM
LESSONS LEARNED FROM NJ'S FIRST SUNFLOWER MAZE

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The Sussex County Sunflower Maze™ opened for the first time in August of 2011. The 30 acre black oil sunflower maze is believed to have been the first sunflower maze in NJ and the biggest on the east coast. I started growing black oil sunflowers the previous year (2010), at Liberty Farm, located in Sandyston, NJ. The seeds are sold through a partnership with NJ Audubon, for their S.A.V.E.™ Brand birdseed program. When our first field of sunflowers bloomed in July of 2010, I realized that I had found a very special crop. The views of the sunflower field were breathtaking, and I never tired of walking around the blooming fields of color. I believe by creating the Sussex County Sunflower Maze™, I have found a great way to share this rare, and enlightening experience.

The Sussex County Sunflower Maze™ was a huge success. As a first adventure in to the world of Agritourism, we started out small. Each day we added something new, improved on the day before, and strived to improve the customers' overall experience. Our customers loved the idea. They truly appreciated agriculture and the beauty the sunflower field brought to the area. Many people just stopped in to say thank you. Thank you for trying something new. They not only supported our farm, but also patronized local businesses, retail stores, other local farms and markets, restaurants, gas stations and hotels. The maze was cut short by Hurricane Irene, but it proved Agritourism has the potential to boost the local economy. We will be ready next year.

Lessons Learned:

When considering your own creative agriculture event, try to have a unique idea, different from everyone else. Before starting your Agritourism project, spend time planning it out. Make a Business Plan. It does not have to be a professional bank ready document, but you have to know the numbers, before you can start. What are your start up costs? Operational costs? What are some realistic income projections?

The business plan should lead into a solid Marketing Plan. The stronger your marketing plan is, the better your Agritourism event will be. **First** and foremost, you must have a good website. It does not have to cost a fortune, or have all the latest bells and whistles. It needs to establish who you are, what you have to offer, where you are (a GPS searchable address), what kind of experience the public can expect, how much it costs, hours of operation, and how to contact you. Place your phone number in large

font, at the top of the website so mobile users can find it quickly! Your web page is a great place to warn people about any special requirements, such as closed toed shoes, pet policy, allergies, sun screen, hats… **Second**, learn to use Facebook and Twitter. It may seem daunting at first, but start. Ask people around you for help, and you will catch on. Both Facebook and Twitter have online help, and when in doubt, ask a kid! You can now link them, so when you post on Twitter, it also posts on FB. In the world of Twitter, the old adage "If you build it they will come" is very true. If you have a great Agritourism experience to offer, start tweeting about it, post some pictures, and people will start following and they will come! I had a family drive down from Boston, because they saw a post on Twitter. **Third,** protect your ideas! Look into Trademarks, and copyrights. You should also include in your marketing plan: a press release, email invitations, flyers or posters for high traffic areas such as store bulletin boards and delis, on site banners, road signs, and farm brochures (People want to take information home with them. Take advantage of this opportunity.) As you grow, you can advertise in newspapers, radio, magazines, and TV. Hold a press conference at your event site, and invite your Local politicians, the New Jersey Department of Agriculture, New Jersey Farm Bureau, Your County Board of Agriculture, friends, family and neighbors. They will all be proud to support your endeavor and the more people that attend, the better the press coverage will be. Remember, the key to successfully marketing your Agritourism event is to promote, promote, promote!

Next you need a layout and operating plan. Where will parking be located? How will you deal with traffic and over flow? Where will customers pay, find restrooms, and buy your farm products? Where will you hold press conferences? Who will design and build your event? Who will maintain it? Who collects the money? Who opens, closes, over sees security, answers the phone, meets with the press, gives interviews, gives tours, problem solves, and who restocks? You cannot do all of it. In my experience, I needed a lot of help, and your staff must represent you. They are the conduit to your customers, and are as important as the quality of your farm product – your reputation is in their hands!

You should also have an Emergency plan including local emergency phone numbers. How will you deal with emergencies? Have an up to date first aid kit. Have the proper insurance. My advice is to start off small. It's great to offer everything, but work up to it. In our situation, adding hayrides required more complicated insurance, so we decided to wait till next year. Have EVERYONE sign a Liability Release Waiver. Discuss this with your Insurance agent and Lawyer, or at least use a standard form available online. When customers sign the waiver, it's a great time to ask them to share their contact information so you can inform them about upcoming events and next year's activities. Now is your chance to catch as much info as they are interested in sharing.

With good planning, your Agritourism event will be off to a great start. You will have a solid foundation to build upon. There will be many things you could not foresee, but with experience your event will grow and improve. I suggest working closely with

your local Rutgers Extension and County Agritourism offices: We are indebted to the services of Steve Komar and Donna Traylor.

At the Sussex County Sunflower Maze™ we did several things that really increased our Agritourism experience. We had a Photo Journalist, located inside the maze, ready to take family pictures. We offered to upload their pictures to Facebook, create photo CD's to take home, and we even offered to submit their photos to local newspapers. (Make sure you get a photo release!) We created a scavenger hunt with prizes for the kids. The scavenger hunt consisted of 6 items, located through out the maze: an owl, a US flag, a NJ Farm Bureau dressed scarecrow, a dairy milk can, a bird house, and the tallest sunflower in the field. Each item gave an educational opportunity and allowed for further discussions. We found out the adults were also very interested in the scavenger hunt! After completing the scavenger hunt, the kids received a small bag of Black Oil Sunflower Seeds with all our marketing information on it! Parents are always looking for new educational things to do with their kids! Cater to these needs. We offered Maps of the maze, self guided tour sheets, insect ID sheets, NJ Audubon guided field tours, locally grown food, and locally produced products. People want to meet their local farmer, hear your story, and buy your products. At our events, I always try to be aware of product placement. As the cofounder of Jersey Devil Salsa ™ (www.JerseyDevilSalsa.com), we show cased it with banners and displays, along with our Liberty Farm Garlic Jelly™ (www.SaveLibertyFarm.com), NJ Audubon's Made with Jersey Grown Wood Bird Houses and Feeders, and of course, S.A.V.E.™ Brand Black Oil Sunflower Seeds. We also offered cut sunflower bouquets that were very popular.

My advice is to create your own Value Added Products grown on your farm. Remember, when people come out for your Agritourism event, they want to buy your products… Make it easy for them. Charge a fair price, and deliver a great experience – Your customers will return again and again and they will send friends. You won't be able to please everyone, but do your best.

Misconceptions: At times the public confused the sunflower maze with a corn maze, thinking: it was possible to get lost; it would last for months; it would be easy to grow and anyone could plant a small field at home. We had to explain that you could see over the flowers; it was not claustrophobic; that the blooms were weather dependant and lasted at best several weeks; and sunflower fields like ours are difficult to grow, have high production costs, and need specialized equipment and care.

www.SussexCountySunflowerMaze.com

COMMUNITY SUPPORTED AGRICULTURE: GETTING THE RIGHT FIT

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Farming in the Northeast is unique compared to other parts of the United States. The uniqueness brings challenges as well as opportunities. One of the most positive opportunities is proximity to population and markets, especially the ability to retail farm products. One such method of retailing farm products to a local population is through a system known as Community Supported Agriculture or CSA. With the “buy local” movement at its peak the CSA market idea has a strong following in current times. Think of a CSA business as a type of “membership” or “shareholder” sale of your farm product. Again, I use the word unique, since the CSA venture takes a unique farmer to pull it off and a unique customer to “support” this type of marketing.

How does the CSA marketing system work? A farmer, or in some cases a group of farmers, sell memberships or shares of products to individual customers and promise those customers a given product on a regular basis for a certain period of time. What will the customer buy? Customers will purchase what is almost like a contract that states the farmer will provide them with a share of the harvest, maybe weekly for so many weeks. Some farmers offer their members/shareholders a full share or a half share or some other scale of products to purchase. Whatever the time period for products, what ever what size of share, the farmer is almost always paid the membership fees at the beginning of the season and a contract is generally signed signifying the farmer will provide the product and the member will follow the rules set up for the CSA.

Distribution of the CSA shares can be tricky. When a CSA begins the customer base may be small and it isn’t difficult to set up a pick up time for a small amount of customers on the same day. However, if you customer base grows and you have a few hundred members/shareholders, having them pick up their products all on the same day can be quite challenging for you and frustrating for them. Growth can be a good thing financially, but it must be managed properly. Having scheduled pick up times and dates for each member may be essential as the CSA membership grows. It is crucial for members to adhere to these times and days to have the business run smoothly and to be fair to you and other members. So pick up time can be an issue, but so can how the shares are distributed. Do you have a pre-made box of items ready to pick up that includes the same products for all members? Do you instead let members choose their own items and fill a specific sized container? Finding out what fits best for your business and your customers is key. Giving customers more choice and flexibility may be a good fit. Displaying all items available in a “Farm stand” type layout and putting limits on the

amount each member/shareholder can take during that visit is a good way to go. Also, during that weekly visit the member/shareholder is allowed to take an amount of product that will fit into their “share-size” container. An example would be a full share fills a bushel size basket each week, while a half share fills a ½ bushel size basket. Once the container is full the weekly share if met.

Members/shareholders of a CSA can also be more than just paying customers who pick up products each week. Some may offer more than just a customer base by offering to assist on the farm with the harvest, weeding, and set up or cleanup of the market or other management chores. Some may be excellent communicators and can help with customers coming during pick up times. Others may have talents in writing recipes, newsletter articles or advertisements that enhance your CSA business.

On the production end of the CSA business, the farmer needs to be a good manager and producer. Management is the major key for success of any farm, but especially for a CSA where products are promised to pre-paying customers. CSA’s are not for novice or inexperienced farmers. Since the farm will most likely be producing a diverse crop list, make sure to design plantings for labor efficiency. This may mean having wider between row spacing and planting crops with harvest dates that are close together to be able to finish fields sooner to allow for double cropping. Make sure to have the right tools, harvest containers and packaging supplies. Remember you are selling directly to the consumer in smaller amounts; it is not a wholesale package that is supplied to the CSA member.

Starting and keeping a CSA business can be challenging, but can also be very rewarding both personally and financially. Each CSA business will be unique and finding the right fit with your customers/members is key. Working through the first years and adapting to changes to make it work will ultimately bring success.

RUNNING A SUCCESSFUL CSA (COMMUNITY SUPPORTED AGRICULTURE)

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JAH'S CREATION Organic Farm is one of the first farms in southeastern New Jersey to operate a successful CSA farm. When I mention success, I don't want anyone to be misled into thinking that this farm is making a ton of money, yet. The potential for profits is definitely there and everyone can feel the momentum of this movement. There are plenty of CSA farms throughout this state and many are larger than JAH'S CREATION, but the reputation and membership continue to grow every year.

A CSA (Community Supported Agriculture) consists of a community of individuals who pledge support to a farming operation where the growers and consumers share the risks and benefits of food production. CSA's usually consist of a system of weekly delivery or pick up of fresh produce, sometimes including dairy products and meat. An internet search on "Community Supported Agriculture" will return lots more about the history of CSA development and alternative structures for a CSA enterprise.

While most CSA's will differ in their ways, the basic concept is pretty much the same. A farm sells shares for the following season's crops, in advance of that season. As a new farm this CSA is the backbone of operations. It provides me with the working capital that I need to run the farm without heading to the bank for a loan. The risk is shared by the farmer and consumer. The consumer puts up the seed money and the farmer puts out the crop, rain or shine.

Through the past 4 years I have built a very nice following of dedicated CSA members and have been working towards my goal of having a truly sustainable farm. I started my first CSA in 2008 with just 20 members and grew into 170 members by the 2011 season. JAH'S CREATION currently provides 34 weeks of produce to CSA members every year. My goal is to have a 500 member CSA by the year 2014 and to provide year round produce in 2015.

I have seen people come and go in this CSA. I now understand that the CSA concept is not for everyone. Many people will lose interest in a CSA after a while, if not catered to properly. I am constantly working on ways to maintain and build CSA membership numbers through social media networking, farmers markets, farm tours, dinners and by attending cultural events.

Before starting a CSA, one must understand that many complications will arise when growing a line of crops for a large group of families. You must be prepared for anything and be sure to have product week after week. Each and every season comes with its own bumps in the road. I constantly reflect on those bumps and make any adjustments necessary to be better prepared for the future.

Understand, there are many ways to run a CSA but you must first decide on which method(s) will work best on your farm (ie. Market Style, Drop Off Location(s), Mail Order/Internet, or Direct Delivery). After you decide on the style of CSA that you will run you must decide on how many shares you will offer and how long your season(s) will be. This all depends on how hard you are willing to work and for how long you want to work into the seasons.

Once you know what style CSA you will manage and how long your season will be, you must consider how many shares you will be able to commit to producing for the season. You also need to know what crops you will grow. These factors will determine the amount of land that you will need to dedicate to your CSA production.

Keep in mind that you will likely need to grow many more and different varieties of produce than a normal wholesale farm would grow to keep things interesting for your CSA members. That can be fun, though definitely challenging, for the farmer as well. You will need a tighter planting schedule with smaller and more frequent succession plantings to maintain a constant flow of fresh produce to your members week after week.

At JAH'S CREATION Organic Farm I always consider the yields that I need to attain in order to meet the demand of my CSA members. My clientele pays for produce and if they do not receive that produce every week, I do not believe that they will stay with me for long. (Bad words travel much faster than good words.)

After developing a good understanding of your goals, you must now make the sales. Timing and approach to sales depends on your customers' demographics and the willingness of potential clientele to invest in your farm. At times, it has been easy to make sales and at other times it has been a painstaking, stressful process. You must target your market and time things properly.

I attracted my first CSA subscribers because I was featured in numerous newspaper articles for selling my organic produce directly to high end restaurants. I was approached by a nutritionist’s office who insisted that I start a CSA for their cliental. I also grew my CSA by offering business cards and brochures, as well as displaying posters at the farmers' markets where I was selling my produce. I developed a web site to tell my story and attract new customers and I am now setting up some things on FaceBook. Finding new customers is the first step in building a CSA. Keeping satisfied customers is what makes a CSA successful, and keeping the communication lines open is the key here.

Through the help of a few CSA member volunteers (you’d be surprised how much your members might want to help you succeed!), I produce weekly product lists that have recipe suggestions and periodic email newsletters to describe what's happening on the farm. I participate in farmers markets and festivals. Most recently, I've been gaining a tremendous amount of feedback from my customers by hosting CSA dinner events. These events help us all have a better understanding of what everyone expects from a CSA, both farmer and consumer. I have learned that while, "You can't please all of the people all of the time", you can work things out for the better when you communicate with your customers.

BLUEBERRIES

SESSION

PLUM CURCULIO UPDATE:
RESULTS ON NEW MONITORING AND MANAGEMENT STRATEGIES

Cesar Rodriguez-Saona, Faruque Zaman, Dean Polk,
and Robert Holdcraft
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Plum curculio is a native pest of several fruit crops in the Northeastern US, including blueberries. In blueberries, plum curculio has historically been considered an occasional pest; however, in recent years, levels of plum curculio infestations have increased in New Jersey. Adult activity begins during bloom. At this stage, adults are observed feeding on flower petals until young fruits are available for oviposition. Females make characteristic crescent-shaped oviposition scars on young fruits. Infested berries will turn prematurely blue and drop from bushes. In addition to oviposition and feeding damage, plum curculio larvae are a significant contamination issue in harvested fruit of early blueberry cultivars.

Current monitoring methods rely on the use of beating trays to record adult activity and visual observations of oviposition scars on berries. There are no current thresholds based on these monitoring methods, and they are labor-intensive and inaccurate. A better method to monitor plum curculio populations for timing of insecticide applications is desperately needed. Adults are active during bloom and feeding scars are not noticeable until berries are already damaged. A monitoring tool that can detect early adult activity will allow growers to make better management decisions.

Blueberry growers have historically used broad-spectrum insecticides, such as Guthion, Diazinon, and Lannate, to control cranberry fruitworm and other pests soon after bloom. These compounds helped maintain plum curculio populations below economic threshold levels. However, after the enactment of the US Environmental Protection Agency's (EPA) Food Quality Protection Act (1996), restrictions were imposed on the use of some of these insecticides. New target-specific "reduce risk" compounds are encouraged for use by EPA to replace broad-spectrum insecticides. Thus, testing the toxicity of new reduced-risk insecticides against plum curculio is critical.

Here we conducted studies to test the efficacy of monitoring traps for plum curculio in blueberries and to evaluate the efficacy of new reduced-risk insecticides against plum curculio.

Plum Curculio Monitoring: This study was conducted in 4 commercial blueberry farms to investigate the response of plum curculio adults to traps baited with benzaldehyde and grandisoic acid. Four 1-acre plots were selected in each farm (total of 16 plots). All plots

faced the forest, and had a history of high plum curculio infestation. In each plot, we placed baited and un-baited pyramid traps (Leskey and Wright 2004). Pyramid traps were placed at 0, 20, and 40 m from the field edge. Baited and un-baited traps were placed 10 m apart. Traps were placed prior to bloom (on 12 April) and monitored twice per week until 15 July. Five bushes near each trap were sampled for adult plum curculio using beating sheet trays to correlate trap captures with on-bush counts.

Pyramid traps baited with grandisoic acid and benzaldehyde captured higher numbers of adult plum curculio than un-baited traps. Both baited and un-baited traps captured plum curculio adults before and during bloom; however, only baited traps captured adults in significant numbers after bloom. Beating sheet samples showed a similar pattern of population abundance on bushes; however, numbers of adults on bushes were lower compared with those on traps. No distance effect was observed in adults captured between traps placed at field edges versus inside the fields.

Plum Curculio Control: This experiment tested the efficacy of a pre-bloom treatment with Rimon combined with a post-bloom treatment of Avaunt against plum curculio on highbush blueberries in New Jersey. The experiment was conducted in two commercial blueberry fields of the mid-late season variety 'Bluecrop', and two fields of the mid season variety 'Duke' at two farms in Hammonton, New Jersey. Two fields of the same variety within 500 meters of each other were selected within each farm, with one field treated with Rimon 8.3EC at 30 fl oz/ac (50 gal/ac volume) pre-bloom and the second field left untreated. All fields were treated post-bloom with Avaunt 30WG at 6 oz/ac (30 gal/ac volume). All fields had at least one side bordering a wooded area, and field size ranged from 5 to 10 acres. Pre-bloom Rimon treatments were applied to the 'Duke' field on 11 April, and the 'Bluecrop' field on 18 April. Post-bloom Avaunt treatments were applied as soon as honeybees were removed, for 'Duke' on 20 May, and 'Bluecrop' on 22 May. Four samples of 30 berries that showed plum curculio oviposition marks were collected from each field before the post-bloom Avaunt treatment on 16 May, and again 3 days after the Avaunt treatment on 23 May (Duke) and 25 May (Bluecrop). Collected berries were placed on clean moist playsand in 5.5 oz soufflé cups (Dixie®, Atlanta, GA), and capped with ventilated lids. Berry cups were kept for 35 days in a 25°C incubator on a 15:9 L:D cycle to allow any plum curculio larvae to develop. At the end of 35 days any remaining berries were cut open to check for any overlooked larvae. All plum curculio larvae resulting from berry samples were tallied and % emergence calculated based on the original 30 scarred fruit. Data were analyzed using ANOVA and means separation by Fisher's LSD test at $P = 0.05$. Percent data were arcsine square-root transformed prior to analysis.

Pre-bloom Rimon treatment reduced larval emergence by 65% and 58% compared with untreated controls in Bluecrop and Duke blueberry fields, respectively (Table 1). The combination of a pre-bloom application of Rimon and a post-bloom application of Avaunt reduced larval emergence by ~ 50% compared with a post-bloom Avaunt treatment alone.

BASED ON THESE DATA A NEW RIMON LABEL WILL BE AVAILABLE FOR THIS USE PATTERN IN 2012.

Table 1

Plot ID	Variety	Pre-bloom Treatment			Post-bloom Treatment			% larvae emerged (Mean±SE)	
		Treatment	Rate/ acre	Spray Date	Treatment	Rate/ acre	Spray Date	Pre AVAUNT	Post AVAUNT
1A	bluecrop	Rimon	30 floz	4/18	Avaunt	6 oz	5/22	19.2 ± 2.5 b	15.0 ± 2.2 c
1B	bluecrop	No Rimon	-	-	Avaunt	6 oz	5/22	55.0 ± 2.2 a	34.2 ± 4.6 ab
2A	duke	Rimon	30 floz	4/11	Avaunt	6 oz	5/20	20.0 ± 1.4 b	21.7 ± 2.2 bc
2B	duke	No Rimon	-	-	Avaunt	6 oz	5/20	47.5 ± 2.8 a	36.7 ± 2.7 a

Means within a column followed by different letters are significantly different (Tukey test, P≤0.05)

References:

Leskey, T.C. and S.E. Wright. 2004. Monitoring plum curculio, *Conotrachelus nenuphar* (Coleoptera: Curculionidae), populations in apple and peach orchards in the mid-Atlantic. J. Econ. Entomol. 97:79–88.

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BLUEBERRY POLLINATION

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Bee pollination benefits the production of cultivated blueberry (*Vaccinium corymbosum*) by increasing fruit set and berry weight, and by shortening ripening time. Here we report the results of a 2-year study of blueberry pollination in commercial blueberry fields in the vicinity of Hammonton, New Jersey. We worked at 18 farms, and collected data at each farm on three different days during the peak bloom of blueberry in April-May of 2010 and 2011. The first question our research addressed is, What is the contribution of native, wild pollinators to blueberry pollination, as compared to the contribution of managed honey bees? We observed 38 native, wild bee species visiting blueberry flowers. On average wild bees accounted for 22% of the pollinator visits to blueberry flowers (range across farms and years, 0% to 95%). Honey bees, which were stocked at all farms, accounted for the remaining 78% of visits (range across farms and years, 5% to 100%). The farms receiving the most pollination from native, wild bees had more natural and semi-natural habitat in the vicinity of the farm field and were situated within less agriculturally intensive areas.

The second question our research addressed is, Are blueberry crops under-pollinated? We investigated this question both by doing pollination experiments with flowers, and by analyzing berry weights from transects that differed in honey bee density. First, we conducted experiments to compare the fruit set, berry weight and ripening time for unmanipulated flowers left open to ambient pollination, as compared with flowers that were fully pollinated by hand. If the production resulting from hand-pollinated berries is greater than that resulting from open pollinated berries, this suggests that production is pollination-limited and that increased honey bee stocking might increase production. Because different blueberry varieties are known to have different pollination needs, we conducted separate experiments for two varieties, Duke and Bluecrop. We first compared the proportion of flowers that set fruit for open pollinated versus fully hand-pollinated flowers. For Duke, open-pollinated flowers had an average fruit set of 80% (+/- 34% SD) compared to hand-pollinated flowers 92% (+/- 16% SD) ($t=1.94$, $p = 0.06$). For Bluecrop, open-pollinated flowers had an average fruit set of 75% (+/- 34%, SD) compared to hand-pollinated flowers 86% (+/- 30% SD) ($t=1.96$, $p = 0.05$). Second, using only those fruits that set, we compared berry weights after 42 days of ripening. For Duke, open-pollinated flowers had an average berry weight of 0.93 g (+/- 0.31 SD) compared to hand-pollinated flowers 1.01 g (+/-0.29, SD) ($t=2.36$, $p = 0.02$). For Bluecrop, open-pollinated flowers had an average berry weight of 0.51 g(+/- 0.31, SD) grams compared to hand-pollinated flowers 0.68 g (+/- 0.29 SD) grams ($t=4.09$, $p =$

0.0001). Third, ripening time, measured by the proportion of berries that were blue or had started to change color at 42 days, was shorter for hand-pollinated flowers than for open-pollinated flowers. Overall, our research suggests that both fruit set and berry weight could be increased by increasing pollination levels, assuming that plants have sufficient resources to increase their fruit production at the whole-plant scale.

A second way in which we addressed the question of potential under-pollination was by measuring honey bee visitation rate to blueberry flowers within a 50 meter transect and then relating this measure to average open-pollinated berry weight in the same 50 meters. For both Duke and Bluecrop, there was an increase in fruit weight at sites with higher honey bee activity, but the increase was not large in either case. For Duke, we found a statistically significant increase in berry weight with increasing honey bee visitation to flowers, but the relationship was not strong (R^2 = 0.18, P = 0.004). For Bluecrop, we found a very similar result (R^2 = 0.17, P = 0.002). This second approach to investigating potential under-pollination, by relating honey bee visitation to fruit production,also suggests that blueberry production could be increased by increasing pollination levels.

WILDLIFE CONTROL

SESSION

COOPERATION AND AN INTEGRATED MANAGEMENT APPROACH IS RECOMMENDED FOR REDUCING GOOSE DAMAGE

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Services program in New Jersey (WS)

Canada geese are a natural resource with aesthetic value, but when locally overabundant they can pose problems, as farmers have known for several years. Once thought to be almost extinct, the resurgence of this large waterfowl represents both a conservation success story and a challenge. Nowhere is this truer than the Garden State, home to the highest density of resident Canada geese in the Atlantic Flyway and situated in the center of the Flyway for migrating geese.

Canada geese can be divided into two groups, residents and migrants,both protected by the Migratory Bird Treaty Act (MBTA). In 2011 NJ's resident Canada goose population was 70,735 birds, while the winter population of migratory and resident birds was 106,025. In a 2006 environmental study, the United States Fish and Wildlife Service (USFWS) and the Atlantic Flyway Council recommended that NJ's resident Canada goose population be approximately 41,000 birds. Resident Canada geese, found in NJ year-round,breed and nest in the state, while migratory Canada geese are here during October to March when they either stopover for short periods or spend the winter.

Hunting represents one of the most common methods to deal with overabundant Canada goose populations. NJ hunting regulations are liberal during months when only resident birds are present. Bag limits and regulations during winter months are more restrictive because harvest during this time affectsCanada geese throughout the Atlantic Flyway. States develop hunting seasons and limits under guidelines set by USFWS; New Jersey's long season and liberal resident Canada goose bag limits maximize hunting opportunities.Unfortunately, farmers often experience damage outside hunting seasons. During these times the agriculture community has other options to help control damage.

Successful management of Canada goose damagerequires use of many available and effective tools. WS recommends an integrated wildlife damage management (IWDM) approach which includes:

- deterrents (habitat modification, including crop and vegetation management, and visual stimuli, such as flagging and balloons)
- harassment (pyrotechnics, propane cannons, dogs) and /or
- populationmanagement (egg-and-nest treatmentto inhibit reproduction and lethal removal).

Action taken before goose damage begins is the most effective. Frightening devices should be used as quickly as possible once the geese begin to use fields for feeding. After a feeding pattern is established, hazing the waterfowl from the area becomes more difficult. Methods must be alternated frequently to avoid geese becoming used to them, which decreasestheir effectiveness.

The most beneficial program deals with geese on multiple properties within an area experiencing damage. When severalnearby properties employ active IWDM methods, the problematic geese have no readily available agricultural resources.The option to leave one field where they are harassed and move to a neighboring agricultural property is no longer available. The greatest damage reduction will be realized when a management program usesmanytools in a broad area.For instance, lethal removal and harassment occurring on multiple fields within a township on the same day could be an effective approach: one field could use propane cannons, another balloons and flags, while a third could use shooting under a depredation permit.

Certainly, farmers may not have time themselves to implement egg-and-nest treatment during the busy spring planting season, but this is vital for properties with water features. Farmers can obtain a free online registration, which allows friends or others to conduct this simple treatment, which prevents hatching. Smaller numbers of resident Canada geese reduce the decoy effect when migratory geese arrive.Farmers should also reach out to neighboring landowners with possible nesting habitat to also sign-up for a free online permit to treat eggs on their property. A factsheet and video on Canada goose egg treatment can be found at http://www.aphis.usda.gov/wildlife_damage/waterfowl/50_cfr21.50.shtml. This website also provides a link to register for the free online permit offered by USFWS.

Depredation Permits Offer Some Relief

Since all Canada geese are protected under the MBTA, a depredation permit is required to lethally remove birds outside of the hunting season. Thefederal permit application can be found online at www.**fws.gov**/forms/3-200-13.pdf. It also requires that a WS Form 37 be completed and accompany the depredation permit application. This can be accomplished by contacting WS in your state at 1-866-4USDAWS.

Federal depredation permits are issued by the USFWS. When applying for or renewing a depredation permit, the applicant can list multiple subpermittees (employees, relatives, friends, etc) who they wish to carry out the activities of the permit. Admittedly, depredation permit regulations for removing geese differ greatly from hunting regulations. Under a federal depredation permit, geese cannot be lured into an area with decoys or calls, blinds are not allowed and the geese cannot be consumed. Instead, geese are taken opportunistically when they are causing property damage.Federal depredation permits may also be obtained for other migratory bird species causing damage to agricultural crops.

Non-lethal techniques must be incorporated into a damage management plan. The USFWS requires that non-lethal techniques must be employed both before the permit is issued and while it is active.A combination of methods, customized for a particular farm and grower's situation, will provide the best results.

The USFWS'feefordepredation permits is currently $100, which covers costs associated with reviewing applications and issuing permits.The cost of the permit, however, is generally minor in comparison to the scope of damage that is occurring. It does take time to receive the completed permit and waiting for up to 8 weeks is not unusual. It is important to plan ahead and apply before the damage is anticipated.

The State government may also issue a permit to control resident geese. The State of New Jersey, Division of Fish and Wildlife, can issue a no-cost permit, called an Agriculture Depredation Order,which is valid only from May 1st through August 31st. Before issuing the permit the Statewill conduct a site visit to verify the reported damage.

For more information on developing and implementing an IWDM plan for Canada geese or for assistance with permit questions, please call WS at 1-866-4USDA-WS.

PREVENTING CATASTROPHIC FAILURES OF POLY TANKS

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High density polyethylene tanks have been used successfully by growers and commercial pesticide applicators for years. They are less expensive than stainless steel and fiberglass tanks and offer ease of movement when empty, along with rust resistance. Polyethylene tanks are low maintenance and relatively reliable for storing and transporting agricultural liquids.

While the benefits of poly tank ownership are well established, the risk of tank failure is real. Like any piece of equipment, poly tanks need to be inspected and maintained to ensure that the benefits of use outweigh the risk of tank failure and product release.

Experience has shown that environmental, management and design factors determine how long a tank will last, and those annual inspections help prevent the unexpected and potentially catastrophic release of contents due to tank failure.

These maintenance strategies help extend a poly tank's useful life:

-- Selection of the right tank for the intended use, based on specific gravity.
-- Use of the tank as intended – vertical tanks for storage, horizontal tanks for storage or transport.
-- Protection from UV radiation.

Never purchase a use tank without knowing its history. If you intend to buy a used tank or an inexpensive one that appears in good condition, take the time to conduct a proper inspection; and secure information from the manufacturer if at all possible. Without exercising these precautions, you may encounter sudden tank failure resulting in an expensive spill and cleanup, reporting obligations and costly downtime.

The information in this presentation is intended to assist you in making an informed decision on the purchase, maintenance, inspection and ultimate disposal of poly tanks.

The only way to truly assess tank deterioration and damage is to conduct routine inspections each fall and spring. Base your decision to replace a tank on the findings or on the warranty expiration date, if feasible. The following factors contribute favorably to tank longevity.

1. High specific gravity rating
2. Infrequent refilling
4. Protection for UV radiation
4. Stationary Placement

Whether a tank is a few years old or 20 years old, the only way to be sure it is structurally sound is to perform inspections. Fall inspections are highly recommended to provide forewarning of the need the purchase a new tank before spring. The spring inspection, prior to filling, provides reassurance that the tank can safely store or transport the fertilizer or pesticide that you intend to place in it.

Three levels of tank deterioration:

-- Crazing is displayed as a patchwork of the lines.
-- Scratches are open to surface; displace material is evident on the tank's surface; fingernail catches.
-- Cracking causes no displaced material; very abrupt lines may run parallel or Cross at right angles; UV cracking has a dry-rot or alligator-skin look in advanced stages; fingernail may catch.

It is difficult to visually determine a good tank from a bad tank. Three simple inspection techniques that can pinpoint weakened tanks and stressed areas around fittings are:

1. Writing on the tanks with a water-soluble ink marker.
Crazing may signal UV damage. UV crazing, which is very difficult to see, forms in areas where the tank gets maximum sunlight exposure; the lines become more visible when you "color" the tank with a water-soluble marker. The inspection is performed by rubbing the marker over several six-inch sections on the sides of the tank exposed to sun, on the top, and around fittings. Quickly rub off the ink with a dry cloth or paper towel. The ink left behind has penetrated the surface of the tank.

If rubbing the ink off reveals no obvious signs of crazing or cracking, the tank probably is good for another season if use. If the ink reveals cracking or spider webbing where the lines go in all directions, classic UV radiation damage is indicated. Advanced deterioration to the plastic presents a checkered or "dry rot" appearance, indicating loss of elasticity. A tank displaying such symptoms should be replaced or ONLY used for water.
The appearance of parallel lines signal early UV damage and the need for continual inspections. Tanks with parallel lines in the plastic around fittings should be replaced immediately or ONLY used for water.

2. Candling with a light
Candling consists of placing a bright, cool light source inside a poly tank while conducting a visual inspection from the outside (do not use a hot lamp as it could melt the tank). Defects and cracks usually show up as areas or lines of different light intensity.

Repeat this procedure with the light on the outside of the tank and someone looking through the fill neck or manway. Do not enter the tank. A camera, camcorder or other optical device may be helpful in recording the inspection from the top of the tank.

3. Hitting with a baseball bat
An empty tank showing UV cracking can be further evaluated by striking it with a baseball bat. Most people are afraid to hit their tank with a bat, fearing that they might break it, but that's just it: if it breaks, it should not be in service. Cracking an empty tank with a bat is a better option than risking it breaking when filled with fertilizer or pesticide.

A good tank has the flexibility to bend outward as it is filled and inward as it is emptied. Tanks that are brittle (i.e., that exhibit excessive or advanced cracking) have lost the ability to flex under pressure and to rebound when impacted. The brittleness of an empty tank can be tested with a solid swing of a baseball bat where signs of cracking were discovered during the water-soluble ink inspection. Hit the tank along the sides and top where they receive the most sunlight; then check the tank for signs of breakage. It is impossible to crack a good tank using this method because the polymer is strong and resilient; if the tank cracks or breaks open when hit by a bat, you may have saved yourself from disaster.

The above text is form the publication "Poly Tanks for Farms and Businesses .. preventing catastrophic failures", Purdue Extension PPP-77, which served as the basic for this presentation.

N O T E S